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ENCYCLOPEDIA

Britannica

Foreword

T he need for information and the craving for knowledge are timeless and universal. The Britannica Concise Encyclopedia satisfies the essence of both these needs. This volume represents the distillation of essential information into a compact and eminently useful single volume.

This latest version of Britannica Concise Encyclopedia answers today's need for a portable, convenient reference work covering history, geography, the sciences, religion, sports, entertainment, technology, and the arts. We hope it will become a favourite source for helping students with their homework, for background to news events, for writers and crossword-puzzle enthusiasts, for solving disputes, and for random browsing.

This printing of Britannica Concise Encyclopedia has been broadly revised. Among the 2.8 million words that make up the nearly 28,000 entries are many new titles and many that have been updated. In the 16-page colour plates section, you will find the

newest versions of national flags as well as a world map, maps of world religions and population characteristics, a selection of World Heritage sites, and a useful world map depicting international time zones. More than 30 tables catalog everything from Nobel Prize winners to chemical elements to popes to the International System of Units of measurement and their U.S. equivalents. Many of the more than 190 maps have been revised, and all of the more than 150 illustrations have been redrawn. The more than 2,000 photographs enhance both the appearance and content of Britannica Concise.

The editors of Encyclopaedia Britannica are proud to present the Britannica Concise Encyclopedia. We hope that you will consult it often and that it will both satisfy your immediate need for information and lead you to the in-depth information of the 40 million words of the Encyclopaedia Britannica.

Creating the highest level of reference works has been our goal for 238 years, and we are pleased to welcome you to the Britannica family.

Anita Wolff
Editor

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Explanatory Notes

Alphabetization. The articles are alphabetized word by word, with further alphabetizing letter by letter within a word. A "word" is here defined as a unit of one or more characters set off from other words by spaces, dashes, hyphens, or other symbols. Entry titles consisting of more than one word are arranged in alphabetical order of the succeeding words. Titles with identical spellings are arranged in the order (1) persons, (2) places, and (3) things. The following list illustrates the word-by-word principle:

horn

Horn, Cape
Horn of Africa
hornbill
Horne, Lena
horned toad
Hornsby, Rogers

Further alphabetization rules include the following: (1) Diacritics, apostrophes, dashes, periods, and ampersands are ignored in alphabetization. (2) Names of monarchs and popes that are identical except for the Roman numeral following the name are ordered numerically. (3) Names beginning with Mac- and Me- are ordered literally, all names beginning with Mac- preceding (by a number of pages) all names beginning with Me-. (4) Entry headwords beginning with numbers are alphabetized as if they were spelled out.

Entry headword style. Variant spellings or versions of the encyclopedia's entry headwords are printed in boldface type when they are in common use; more obscure variants are printed in ordinary roman type. No effort has been made to be exhaustive in listing variants.

Several italicized terms are used to discriminate among the variants. The label or simply indicates a

common alternative name or spelling. The label orig. precedes the birth name of a person who is entered under a name that was adopted or acquired subsequently. When a person's original surname is different from the name in the principal headword, the entire birth name is given, not enclosed in parentheses. The label known as precedes a common way of referring to a person that may never have had formal status. The label formerly indicates an

older and generally discarded name for an entity, usually a geographical locale. The label officially indicates a formal or legal version of a name. The label in full precedes a fully spelled-out version of a name that is usually encountered in its shorter form. A label consisting of a language name precedes a native version or spelling of a name or term.

Biographical entry headwords in particular may employ parentheses in several ways. Parentheses may enclose portions of a person's name that are rarely used, a person's original given name or names, a later addition such as a title, or translations of titles or epithets.

drum or croaker
Odin or Wotan

Bacall, Lauren orig. Betty Joan Perske
O'Connell, Daniel known as the Liberator
Iqaluit formerly Frobisher Bay
Latvia officially Republic of Latvia
OCR infill optical character recognition
fax infill facsimile

Magellan, Strait of Spanish Estrecho de Magallanes

Odysseus Roman Ulysses
Connelly, Marc(us Cook)

Doctorow, E(dgar) L(aurence)

Hughes, (James Mercer) Langston
Basil II known as Basil Bulgaroctonus ("Slayer of the Bulgars")

Pronunciations. Entries for terms and names whose pronunciation the encyclopedia's likely users might hesitate over are supplied with pronunciations. Foreign names or terms that are pronounced in a markedly different way by native speakers and English-speakers are frequently provided with two pronunciations, one of them preceded by a language label (e.g., English, French, Spanish). Thus, for Hassan II we provide the pronunciations Vha-san, English ha-'sanV The sym-

bols employed and the sounds they represent are listed on page x.

Romanization of foreign languages. Words from languages that do not use the Western (Roman) alphabet generally reflect the spellings most commonly seen in English-language contexts.

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Chinese names are almost always transcribed according to the Pinyin system. Where a Chinese name or term appears as a headword, the older Wade-Giles spelling is given as an or variant. Place-names and biographical names on Taiwan, however, are generally listed in their Wade-Giles spelling, with the Pinyin spelling as a variant. A few Chinese names widely used in English (e.g., Confucius) retain their traditional English spelling.

Japanese names and terms are generally transcribed according to the Hepburn system but without macrons to indicate vowel length.

Russian names and terms generally observe traditional Western spellings and follow the diacritic-free system employed by the U.S. Board on Geographic Names.

Arabic names and terms generally follow the best-established Western usage. Except in a few well-established Western transliterations, the l in the article nl- or el- ("the") is not assimilated to a following consonant (thus, we employ the spelling Harun nl-Rnshid, not Harun ar-Rashld), even though such assimilation reflects Arabic pronunciation and is sometimes encountered in English sources.

Cross-references. Cross-references to other articles are indicated by small capitals in sans-serif type for the alphabetized element of the term or name. Thus, "J. von Neumann" sends the reader to the V's, "J. W. von Goethe" to the G's; "Cape Breton Island" sends the reader to the C's, "Cape of Good Hope" to the G's; and so on. In the case of personal names in which

there is no ambiguity as to alphabetical placement, the entire name appears in small capitals.

A term is cross-referenced only when it is likely that the reader of the article within which the cross-reference appears would want to be notified about the

additional article. Hence many terms for which there are corresponding entries are not highlighted as references. For instance, in the article on Tim Berners-Lee, we have cross-referenced "World Wide Web" (whose invention was his principal achievement) but not "Internet," which is naturally cross-referenced within the "World Wide Web" article. Because cross-referencing of this kind is discretionary, readers should not assume that a noun lacks its own entry simply because it is not referenced within the article being read.

For the sake of saving space, many people who receive their own entries have their given names abbreviated and their surnames in small capitals when they are mentioned in an article, regardless of how likely the reader of the article is to want to be alerted to the biographical entry. The names of countries, U.S. states, and Canadian provinces, by contrast, are virtually never referenced, regardless of their centrality to a given article, on the presumption that readers will correctly assume that the encyclopedia contains articles on all such entities.

Some 3,000 cross-references are provided at their own alphabetical place, to direct the reader who has looked up a variant version of the name or has expected an entry to be alphabetized according to an element other than the one actually used.

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Abbreviations

Mass.

Md.

Massachusetts

Maryland

AD

anno Domini

Me.

Maine

Adm.

Admiral

mi

mile(s)

Ala.

Alabama

Mich.

Michigan

Amer.

American

Minn.

Minnesota

Ariz.

Arizona

Miss.

Mississippi

Ark.

Arkansas

ml

millilitre(s)

BC

before Christ

mm

millimetre(s)

C

Celsius

Mo.

Missouri

c.

circa

Mont.

Montana

Cal.

California

mph

miles per hour

Capt.

captain

N

North

cc

cubic centimetre(s)

N.C.

North Carolina

cent.

century, centuries

N.D.

North Dakota

cm

centimetre(s)

NE

northeastern

Co.

Company, County

Neb.

Nebraska

Col.

Colorado, Colonel

Nev.

Nevada

Conn.

Connecticut

N.H.

New Hampshire

Corp.

Corporation

N.J.

New Jersey

cu

cubic

N.M.

New Mexico

D.C.

District of Columbia

NW

northwestern

Del.

Delaware

N.Y.

New York

Dr.

Doctor

Okla.

Oklahoma

E

East

Ore.

Oregon

e-g-

exempli gratia (for example)

oz

ounce(s)

est.

estimate, estimated

Pa.

Pennsylvania

Eth.

Ethiopia

Ph.D.

Doctor of Philosophy

F

Fahrenheit

Pres.

President

fl.

flourished

Queen.

Queensland

Fla.

Florida

r.

reigned, ruled

ft

foot, feet

Rev.

Reverend

g

gram(s)

R.I.

Rhode Island

Ga.

Georgia

S

South

Gen.

General

s.c.

South Carolina

Gov.

Governor

S.D.

South Dakota

i.e.

id est (that is)

SE

southeastern

111.

Illinois

Sen.

Senator

in.

inch(es)

sq

square

Ind.

Indiana

St.

Saint

Jr-

Junior

sw

southwestern

K

Kelvin

Tenn.

Tennessee

Kan.

Kansas

UN

United Nations

k g

kilogram(s)

u.s.

United States

km

kilometre(s)

Va.

Virginia

kph

kilometres per hour

vs.

versus

Ky-

Kentucky

Vt.

Vermont

La.

Louisiana

W

West

lb, lbs

pound, pounds

W.V.

West Virginia

m

metre(s)

Wash.

Washington

M.A.

Master of Arts

Wise.

Wisconsin

Maj.

Major

Wy.

Wyoming

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Pronunciation Symbols

3

banana, collide, abut, humdrum

6

saw, all, caught

3

preceding \1\, \n\, \m\, \q\, as

ce

French boeuf, German Holle

in battle, mitten, eaten, lock and
key \- 3 rj- \ ; following \1\, \m\, \r\.

oe

French feu, German Flohle

as in French table, prisme, titre

oi

coin, destroy

ar

further, merger, bird

P

pepper, lip

a

mat, gag

r

red, car, rarity

a

day, fade, aorta

s

source, less

a

bother, cot, father, cart

sh

shy, mission, machine, special

a

father as pronounced by speakers

t

tie, attack, late, latter

who do not rhyme it with bother,

French patte

th

th

thin, ether

then, either, this

au

now, loud, out

ii

rule, youth, union X'yun-yonX,

b

baby, rib

few X'fyiiX

ch

chin, nature X'na-chorX

u

pull, wood, book

d

did, adder

IE

German fiillen, hiibsch

e

bet, bed, peck

U2

French rue, German fiihlen

e

beat, easy

V

vivid, give

f

fifty, cuff

w

we, away

g

go, big

y

yard, cue X'kyiiX, union

h

hat, ahead

X'yiin-yanX

i

tip, banish

y

indicates that during the articula-

l

site, buy

tion of the sound represented by

j

gem, judge

the preceding character the front

k

kin, cook, ache

of the tongue has substantially the
position it has when pronouncing

k

German ich, Buch

y, as in French digne XdenA

1

lily, pool

z

zone, raise

m

murmur, dim

zh

vision, azure X'a-zhorX

n

no, own

1

precedes a syllable with primary

n

indicates that a preceding vowel
or diphthong is pronounced with

(strongest) stress: X 'pen-man-
,ship\

the nasal passages open, as in

l

precedes a syllable with secondary

French un bon vin blnnc

(medium) stress: X 'pen-man-

\oe n -bo n -va n -bla n \

.shipX

q

singX'siqX, singer\'sii]-or\.

-

marks syllable division

fingerX'fiq-garX, inkX'iqkX

()

indicate that what is enclosed is

o

bone, know, beau

pronounced by some but not by
others -.factory \'fak-t(a-)re\

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Map Legend

Map Legend

Cities and towns

Sao Paulo #

MeXiCoCit V® National capital

Albuquerque^

Lausanne B

Second level
political capital

Other administrative
centre

Boundaries

Other Features

— International

SERENGETI

■ ■ ■ Canal

Disputed

national park Natio nal park

Mount Everest

— — — Aqueduct

Line of control

29,035 ft. A Mountain peak

Dam

Second level political

~ J River

Falls

Third level political

Intermittent river

Rapids

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A Coruna ^a-ko-'rii-nyaV Spanish La Coruna City (pop., 2003 est.: 243,902), northwestern Spain. A seaport on the Atlantic Ocean, it is believed to antedate Roman times. A point of departure for the Spanish Armada in 1588, it was sacked by Sir Francis Drake in 1589. In the Peninsular War, it was the site of a notable victory by the English over the French. It is now a large fishing centre and one of northern Spain's most important shipping ports.

A&P See Great Atlantic & Pacific Tea Co.

a posteriori See a priori

a priori \,a-pre-'or-e, .a-pri-'or-lX In epistemology, knowledge that is independent of all particular experiences, as opposed to a posteriori (or empirical) knowledge, which derives from experience. The terms have their origins in the medieval Scholastic debate over Aristotelian concepts (see Scholasticism). Immanuel Kant initiated their current usage, pairing the analytic-synthetic distinction with the a priori-a posteriori distinction to define his theory of knowledge.

Aachen Va-kon\ French Aix-la-Chapelle \,eks-la-sha-'pel\

City (pop., 1995 est.: 247,000), western Germany, southwest of

Cologne. It was inhabited by Romans in the 1st century ad. A center of Carolingian culture, and the second city of Charlemagne's empire, it was the site of his great palace. The cathedral built by Charlemagne c. 800 saw the coronation of most German kings of the 10th- 16th century; his chapel, with his tomb, remains as part of the larger Gothic cathedral today. Aachen was part of France 1801-15. It is famous for its many spas.

Aaiun, El See Laayoune

Aalto \'al-to\, (Hugo) Alvar (Henrik) (b. Feb.

3, 1898, Kuortane, Fin., Russian Empire— d. May 11, 1976, Helsinki) Finnish architect and designer. He graduated from the Technical Institute of Helsinki and in 1925 married Aino Marsio, who served as his collaborator. His reputation rests on a distinctive style that blends classic Modernism, indigenous materials (especially timber), and personal expression. His unique blending of Modernism and informal regional character was perhaps best expressed in his civic centre in Saynatsalo (1950-52), with its simple forms in red brick, wood, and copper. He remains one of the Modern movement's most popular architects; reproductions of his bent laminated wood furniture appear in households worldwide.

aardvark or African ant bear Heavily built mammal (Orycteropus afer) of sub-Saharan forests and plains. Its stout, piglike body ("aardvark" is Afrikaans for "earth pig") may be as long as 6 ft (1.8 m), including a 2-ft (60-cm) tail. It has a long snout, rabbitlike ears, short legs, and long toes with large, flattened claws. It feeds at night by ripping open ant and termite nests and lapping up the insects with a long (1-ft, or 30-cm), sticky tongue.

Though not aggressive, it uses claws to fight off attackers. Its classification with regard to other mammals is uncertain.

Aare River \'ar-o\ or Aar River River, central and northern Switzerland. The longest river entirely within Switzerland, it flows northwest from the Bernese Alps and passes through the Gorge of the Aare and by the city of Bern before flowing northeast to enter the Rhine at Koblenz, after a course of 183 mi (294 km).

Aarhus See Arhus

Aaron (fl. 14th century bc) Brother of Moses and traditional founder and head of the priesthood of ancient Israel. According to the Bible, he was the spokesman for Moses and played a central role in forcing the pharaoh to allow the Israelites to leave Egypt. God charged Aaron and Moses with commemorating the event at Passover, and Aaron and his sons were given priestly authority by Moses. Though Aaron is a pivotal figure in Exodus, he nearly fades from view thereafter. He is mentioned as the one responsible for the Israelites' idolatrous worship of the golden calf while Moses was on Mount Sinai receiving the Law from God. His death at age 123

is noted in Numbers.

Aaron, Hank byname of Henry Louis Aaron (b. Feb. 5, 1934, Mobile, Ala., U.S.) U.S. baseball player, one of the greatest in professional baseball. After playing briefly in the Negro leagues and then in the minor leagues, Aaron was moved up to the majors as an outfielder with the Milwaukee Braves in 1954. By the time the Braves moved to Atlanta, Ga., in 1965, Aaron had hit 398 home runs; in 1974 he hit his 715th, breaking Babe Ruth’s record.

He played his final two seasons (1975-76) with the Milwaukee Brewers. Aaron’s records for career home runs (755), extra-base hits (1,477), and runs batted in (2,297) remain unbroken, and only Ty Cobb and Pete Rose exceed him in career hits (3,771). Aaron is renowned as one of the greatest hitters of all time.

AARP formerly American Association of Retired Persons Nonprofit, nonpartisan organization that addresses the needs and interests of Americans aged 50 and older. It was founded in 1958 by a retired teacher, Ethel Andrus, and merged in 1982 with the National Retired Teachers Association, also founded by Andrus (1947). Its bimonthly magazine, Modern Maturity , has the largest circulation of any U.S. periodical. Its membership exceeds 35 million. Its members’ reliably high turnout at the polls has made it one of the most powerful lobbying groups in the country.

abacus Calculating instrument that uses beads that slide along a series of wires or rods set in a frame to represent the decimal places. Probably of Babylonian origin, it is the ancestor of the modern digital calculator. Used by merchants in the Middle Ages throughout Europe and the Arabic world, it was gradually replaced by arithmetic based on Hindu-Arabic numerals. Though rarely used in Europe past the 18th century, it is still used in the Middle East, China, and Japan.

Aba ha i See Hongtaiji

Abakanowicz V.a-ba-'kan-o-.witsV Magdalena (b. June 20, 1930, Falenty, Pol.) Polish sculptor. A descendant of nobility, she graduated from Warsaw’s Academy of Fine Aits in 1955. She became the pioneer and leading exponent of sculpture made of woven fabrics, calling her three-dimensional weavings “Abakans” (from her surname). She produced series of fabric forms called Heads (1975), Backs (1976-80), Embryology (1980), and Catharsis (1986). She has also exhibited paintings, drawings, and sculptures in other media internationally and has been widely

imitated in Europe and the U.S.

abalone \,a-b9-'l6-ne\ Any of several marine snail species (genus Haliotis, family Haliotidae), found in warm seas worldwide. The outer surface of the single shell has a row of small holes, most of which fill in as the animal grows; some remain open as outlets for waste products. Abalones range from 4 to 10 in. (10-25 cm) across and up to 3 in. (8 cm) deep. The largest is the 12 in. (30 cm) abalone (H. rufescens). The shell’s lustrous, iridescent interior is used in ornaments, and the large muscular foot is eaten as a delicacy.

Commercial abalone fisheries exist in California, Mexico, Japan, and South Africa.

Abate, Niccolo dell' See Niccolo dell'Abbate

Abbado \a-'ba-do\, Claudio (b. June 26, 1933, Milan, Italy) Italian conductor. Abbado studied piano, composition, and conducting at the

Abalone (Haliotis)

JACQUES SIX

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Giuseppe Verdi Conservatory before beginning to conduct in Vienna. He was long associated with Milan’s La Scala (1968-86), as principal conductor and ultimately as artistic director, as well as with the Vienna Philharmonic and the London Symphony Orchestra. In 1989 he succeeded Herbert von Karajan as permanent conductor and artistic director of the Berlin Philharmonic. He is known for his commitment to adventurous programming, including much modem music.

'Abbas I known as 'Abbas the Great (b. Jan. 27, 1571 — d. Jan. 19, 1629) Shah of Persia (1587-1629).

Succeeding his father, Muhammad Shah, he strengthened the Safavid dynasty by expelling Ottoman and

Uzbek troops and creating a standing army. 'Abbas made Esfahan Persia's capital, and under him it became one of the world's most beautiful cities.

Persian artistic achievement reached a high point during his reign; illuminated manuscripts, ceramics, and painting all flourished, and the Portuguese, Dutch, and English competed for trade relations with Persia.

Tolerant in public life (he granted privileges to Christian groups) and concerned for his people's welfare, his fear for his personal security led him to act ruthlessly against his immediate family.

'Abbas \ab-'bas\ I (b. 1813 — d.

July 13, 1854, Banha, Egypt) Viceroy of Egypt (1848-54) under the Ottoman Empire. His rule was one of consolidation, when many of the Western-style reforms begun by his grandfather, Muhammad 'Ad, were either discontinued or neglected. Though generally distrusting of foreigners, he allowed the British to construct a railroad between Alexandria and Cairo in 1851. The British, in turn, assisted him in disputes with his Ottoman overlords, whom he nonetheless aided by sending troops to fight in the Crimean War (1853). A recluse, he was murdered by two servants at his palace in Banha.

Abbas, Ferhat (b. Aug. 24, 1899, Taher, Alg. — d. Dec. 24, 1985, Algiers) Algerian political leader who served as first president of the provisional government of the Algerian Republic (1958). Originally a Francophile, he became disillusioned with France, and during World War II (1939 — 45) he issued a condemnation of French rule, demanding a constitution that would grant equality to all Algerians. He joined the National Liberation Front (FLN), which helped achieve independence from France (1958-62). He was elected president of the Algerian Constituent Assembly in 1962 but resigned in 1963 following a dispute within the FLN. See also Young Algerians.

Abbas, Mahmoud also called Abu Mazen (b. 1935, Zefat, Palestine [now in Israel]) Palestinian leader. Abbas earned a law degree from the University of Damascus and a doctorate in history from Moscow State University. In the late 1950s he was one of the founders of Fatah, which spearheaded the Palestinian armed struggle and dominated the Palestine Liberation Organization. In the 1990s Abbas shaped Palestinian negotiating strategy in peace talks that led in 1993 to the Oslo Accords, in which Israel and the Palestinians extended to each other mutual recognition and which called for Israel to cede some authority over the West Bank and Gaza Strip to the Palestinians. He briefly served as prime minister of the Palestinian Authority in 2003 and was elected its president in 2005.

'Abbasid \3-'ba-sod\ dynasty (750-1258) The second of the two great Sunnite dynasties of the Islamic Caliphate. The 'Abbasids took their name from an uncle of the Prophet Muhammad, al-'Abbas, whose descendants formed one of several groups agitating for change under the Umayyad

dynasty. The Umayyad enforcement of a brand of Arab chauvinism, wherein non-Arab Muslims were relegated to a lower status, led to a revolution in which the 'Abbasids claimed the Caliphate and enforced a more universal community of believers. This was symbolized by their movement of the caliphal capital from Damascus to Baghdad, an area closer to the geographic centre of the empire and nearer the Persian hinterland. Under their rule, Islamic culture flourished, new heights in philosophy and science were attained, and the period was widely seen as the

“golden age” of the Islamic world. During that time, however, the Caliphate’s authority slowly began to erode as regional power centres developed throughout the empire. Although central authority was intermittently reasserted by strong-willed caliphs, by the 13th century 'Abbasid authority was largely spiritual. The last 'Abbasid caliph was executed by Mongol invaders, but a shadow Caliphate (of dubious authenticity) continued into the early 20th century. See also AbG Muslim.

Abbate \ab-'ba-ta\, Niccolo dell' or Niccolo dell'Abate (b. c.

1512, Modena, Duchy of Modena — d. 1571, Fontainebleau, Fr.) Italian painter. He was trained in Modena and developed his mature style under the influence of his contemporaries Correggio and Parmigianino in Bologna (1544-52). There he painted portraits and decorated palaces with frescoes of landscapes and figure compositions in the Mannerist style. In 1552 he was invited by Henry II of France to work under Primaticcio at the Palace of Fontainebleau, where he executed immense murals (most now lost). He remained in France the rest of his life. His mythological landscapes were a principal source of the French Classical landscape tradition, and he was a precursor of Claude Lorrain and Nicolas Poussin.

Abbe Vab-e\, Cleveland (b. Dec. 3, 1838, New York, N.Y., U.S. — d. Oct. 28, 1916, Chevy Chase, Md.) U.S. meteorologist. He was trained as an astronomer and appointed director of the Cincinnati Observatory in 1868. His interest turned to meteorology, and he inaugurated a public weather service that served as a model for the national weather service, which was organized shortly thereafter as a branch of the (U.S. Army) Signal Service. In 1871 he was appointed chief meteorologist of the branch, which in 1891 was reorganized under civilian control as the U.S. Weather Bureau (later the National Weather Service), and he served in that capacity more than 45 years.

abbey Complex of buildings housing a monastery or convent under the direction of an abbot or abbess, serving the needs of a self-contained religious community. The first abbey was Monte Cassino in Italy, founded in 529 by St. Benedict of Nursia. The cloister linked the most important elements of an abbey together. The dormitory was often built over the dining hall on the eastern side of the cloister and linked to the central church. The western side of the cloister provided for public dealings, with the gatehouse controlling the only opening to the outer, public courtyard. On the southern side of the cloister were a central kitchen, brewery, and workshops. The novitiate and infirmary were housed in a building with its own chapel, bathhouse, dining hall, kitchen, and garden. In the 12th—13th century, many abbeys were built throughout Europe, especially in France.

The ruins of Fountains Abbey, a Cistercian monastery founded in the 1 2th century, near Ripon, North Yorkshire, England

ANDYWILUAMS

Abbey, Edward (b. Jan. 29, 1927, Home, Pa., U.S. — d. March 14, 1989, Oracle, Ariz.) U.S. writer and environmentalist. Abbey worked as a park ranger and fire lookout for the National Park Service. He wrote a number of volumes on consumer culture's encroachment on the American wilderness. Desert Solitaire (1968), one of his best-known, is set in southeastern Utah. His 1975 novel The Monkey Wrench Gang , describing the exploits of a band of guerrilla environmentalists, inspired numerous real-life activists.

'Abbas I, detail of a painting by the Mughal school of Jahangir, c. 1 620; in the Freer Gallery of Art, Washington, D.C.

COURTESY OF THE SMITHSONIAN INSTITUTION, FREER GALLERY OF ART, WASHINGTON, D.C.

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Abbey Theatre Dublin theatre. It developed from the Irish Literary Theatre, founded in 1899 by William Butler Yeats and Lady Augusta Gregory to foster Irish drama. After moving the troupe to a renovated theatre on Abbey Street in 1904, they codirected its productions with John Millington Synge, staged their own plays, and commissioned works by Sean O'Casey and others. Important premieres included Synge's The Playboy of the Western World (1907) and O'Casey's The Plough and the Stars (1926). The Abbey became the first state-subsidized theatre in the English-speaking world in 1924. A fire destroyed the original playhouse in 1951, and a new theatre was built in 1966.

Abbott, Berenice (b. July 17, 1898, Springfield, Ohio, U.S. — d. Dec. 9, 1991, Monson, Maine) U.S. photographer. She left the American Midwest in 1918 to study in New York City, Paris, and Berlin. In Paris she became an assistant to Man Ray and Eugene Atget. In 1925 she set up her own studio and made portraits of Parisian expatriates, artists, writers, and collectors. She retrieved and catalogued Atget's prints and negatives after his death. In the 1930s she photographed New York's neighbourhoods for the WPA Federal Art Project, documenting its changing architecture; many of the photographs were published in Changing New York (1939).

Abbott, Bud; and Costello, Lou orig. William Alexander Abbott and Louis Francis Cristillo (respectively b. Oct. 2, 1899,

Asbury Park, N.J., U.S. — d. April 24, 1974, Woodland Hills, Calif.; b. March 6, 1906, Paterson, N.J. — d. March 3, 1959, East Los Angeles, Calif.) U.S. comedy team, prominent in vaudeville from 1931 and on radio from 1938. Their first successful film, Buck Privates (1941), was followed by more than 30 other slapstick comedies, with Abbott playing a bullying straight man to Costello's childlike buffoon. Their famous routine "Who's on First?" was first performed in the film The Naughty Nineties (1945). The collaboration ended in 1957.

Abbott, George (Francis) (b. June 25, 1887, Forestville, N.Y., U.S. — d. Jan. 31, 1995, Miami Beach, Fla.) U.S. theatre director, producer, and playwright. In 1913 he began acting on Broadway, and he soon turned to writing and directing plays, achieving his first of many hits with The Fall Guy (1925). He also wrote, directed, or produced many popular musicals, including The Boys from Syracuse (1938), Pal Joey (1940), Where's Charley (1948), Wonderful Town (1953), and Damn Yankees (1955). He was active in the theatre into the 1980s, directing a revival of On Your Toes at age 95.

Abbott, Grace (b. Nov. 17, 1878, Grand Island, Neb., U.S. — d. June 19, 1939, Chicago, 111.) U.S. social worker, public administrator, educator, and reformer. She graduated from Grand Island College and did graduate work at the University of Nebraska and the University of Chicago, receiving a Ph.D. in political science in 1909. In 1908 she began working at Jane Addams's Hull House in Chicago, where she cofounded the Immigrants' Protective League. As director of the U.S. Children's Bureau (1921-34), she fought to end child labour through legislation and restrictions on federal contracts. She worked to win public approval of a constitutional amendment prohibiting child labour; though submitted to the states in 1924, the amendment was never ratified. Her best-known book is The Child and the State (2 vol., 1938).

Abbott, Lyman (b. Dec. 18, 1835, Roxbury, Mass., U.S. — d. Oct. 22, 1922, New York, N.Y.) U.S. minister. Son of the writer Jacob Abbott (1803-79), he left law practice to study theology and was ordained in 1860. He became editor of the Illustrated Christian Weekly in 1870 and editor in chief of Henry Ward Beecher's Christian Union in 1881. In 1888 he succeeded to Beecher's pulpit in Brooklyn. A leading exponent of the Social Gospel movement, he sought to apply Christianity to social and industrial problems, rejecting both socialism and laissez-faire economics. On other problems Abbott presented the viewpoint of liberal evangelical Protestantism.

Abbott, Sir John (Joseph Caldwell) (b. March 12, 1821, St.

Andrews, Lower Canada — d. Oct. 30, 1893, Montreal, Que., Can.) Canadian prime minister (1891-92). Educated at McGill University in Mon-

treal, he became a lawyer in 1847 and was made queen's counsel in 1862. He was dean of McGill University law school from 1855 to 1880. After serving in the legislative assembly (1857-74, 1880-87), he was appointed to the Senate and became government leader. Upon the death of John Macdonald, he became the compromise choice for prime minister. Ill health forced his resignation in 1892.

abbreviation Shortened form of a written word or phrase used in place of the whole. Abbreviations began to proliferate in the 19th century and have been prevalent since; they are employed to reduce the time required for writing or speaking, especially when referring to the myriad new organizations, bureaucratic entities, and technological products typical of industrial societies. An abbreviation can now easily become a word, either as an initialism in which the letters are pronounced individually (e.g., TV or FBI) or as an acronym in which the letters are combined into syllables (e.g., scuba, laser, or NAFTA).

ABC in full American Broadcasting Co. Major U.S. television network. It began when the expanding national radio network NBC split into the separate Red and Blue networks in 1928. To avoid a communi- cations monopoly, NBC was forced to sell the Blue network in 1941. Its buyer, Edward J. Noble, maker of Life-Savers candies, gave the company its present name. After merging with United Paramount Theaters in 1953, ABC expanded into the emerging television industry and soon became one of the three top networks. It specialized in sports broadcasting and developed the instant replay in 1961. It was bought by Capital Cities Communications in 1985 and by the Walt Disney Co. in 1995.

'Abd al-'Az!z ibn 'Abd al-Rahman ibn Faysal Al Sa ud See

Ibn Sa'0d

'Abd al-Malik ibn Marwan N.ab-dol-'mal-ik-.ib-on-mar-'wanV (b. 646/647, Medina, Arabia — d. Oct. 705, Damascus) Fifth caliph (685-705) of the Umayyad dynasty. c Abd al-Malik was forced to flee his hometown of Medina during an uprising against Umayyad rule in 683. Two years later he succeeded to the caliphate and — with the help of his infamous lieutenant al-Hajjaj ibn YOsuf — began a seven-year campaign to defeat all rebellions against the Umayyads and reunify the Muslim world. He resumed the conquest of North Africa, winning the Berbers to his side and capturing Carthage (697) from the Byzantine Empire. His good rela- tions with the clergy of Medina led many to abandon their opposition to the Umayyads. He made Arabic the language of government throughout his domains, struck Islamic gold coins to replace Byzantine ones, and built the Dome of the Rock in Jerusalem.

'Abd al-Mu'min ibn 'All \ 1 ab-d3l- , mu-min- l ib-on-a- , le\ (b. 1094, Tagra, kingdom of the Hammadids — d. 1163, Rabat, Almohad empire) Berber caliph (1130-63) of the Almohad dynasty. Around 1 1 17 he fell under the sway of Ibn Tumart, founder of the Almohad religious movement, and joined him in opposing to the ruling Almoravid dynasty. He succeeded Ibn Tumart on the latter's death in 1130 and for the next 17 years carried on the struggle against the Almoravids. After defeating them at Marrakech in 1147, he massacred many of the city's inhabitants, made Marrakech his home base, and conquered all of North Africa west of Egypt.

'Abd al-Nasir, Jamal See Gamal Abdel Nasser

‘Abd al-Rahman X.ab-dol-rak-'manX III (b. January 891 — d. Oct. 15, 961, Cordoba, Andalusian Spain) First caliph and greatest ruler of the Umayyad Arab Muslim dynasty of Spain. He succeeded his grandfather c Abd Allah as emir of Cordoba in 912. He set out immediately to subdue Muslim rebels in their mountain fortresses, which became an annual task until the Umayyad’ s took Toledo in 933. Addressing the Christian threat to the north, he led the campaigns of Muez (920) and Navarra (924). In 928 he declared himself caliph. By 958 he had Christian kings paying him homage. During his rule, Cordoba was exemplary for its social, political, and cultural development; Christian and Jewish communities flourished, and the city’s fame rivaled that of the Byzantine capital, Constantinople.

‘Abd al-Samad (fl. 16th century) Persian miniature painter. Born in Iran, he traveled to India and became one of the first members of the imperial atelier there. Through their teachings in India, he and fellow countryman Mir Sayyid 'AlI played a strong role in the foundation of the school of Mughal painting. 'Abd al-Samad supervised the majority of illustrations in the Mughal manuscript Dastan-e Amir Hamzeh, or Hamzan-

Lyman Abbott, 1901.

LIBRARY OF CONGRESS, WASHINGTON, D.C.

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ama, which included about 1,400 paintings. Favoured at court, in 1576 he was appointed master of the mint, and in 1584 he was made dm an (revenue commissioner) of Multan.

‘Abd Allah \,ab-dul-Ta\ (ibn Muhammad al-TaTishl) or ‘Abdullahi \3b-,dul-a-'he\ (b. 1846, Sudan — d. Nov. 24, 1899, Kordofan) Political and religious leader who succeeded Muhammad Ahmad (al-Mahdl) as head of the Mahdist movement in the Sudan in 1885. He launched attacks against the Ethiopians and invaded Egypt, securing his position by 1891. In 1896 Anglo-Egyptian forces began to reconquer the Sudan. ‘Abd Allah resisted until 1898, when he was forced to flee Omdurman. He died in battle one year later.

Abd el-Krim V.ab-dol-'kreirA in full Muhammad ibn ‘Abd al-Kar7m al-Khattabi (b. 1882, Ajdir, Mor. — d. Feb. 6, 1963, Cairo, Egypt) Berber resistance leader against Spanish and French rule in northern Morocco. He was chief Muslim judge for Morocco’s Melilla district. He became disillusioned with Spanish policies and eventually led a resistance movement with his brother. He set up the Republic of the Rif in 1921 and became its president. In 1926 he was forced to surrender when faced by a combined French and Spanish army. Exiled to the island of

Reunion, in 1947 he received permission to live in France but took asylum in Egypt while en route. When Morocco became independent (1956), Muhammad V invited him to return, but he refused because of the continued presence of French troops in North Africa.

Abdelkader V.ab-dal-'kad-orX in full ‘Abd al-Qadir ibn Muhyi al-DTn ibn Mustafa al-HasanT al-Jaza’ir7 (b. Sept. 6, 1808, near Mascara, Alg. — d. May 26, 1883, Damascus, Syria) Founder of modem Algeria and leader of its struggle against the French. His father had led a harassment campaign against the French, who invaded Algeria in 1830. Abdelkader succeeded his father as emir in 1832; by 1837, through battles and treaties, he had established his rule over most of Algeria’s interior, leaving the French in control of some port cities. He organized a true state, imposing equal taxes and suppressing the privileges of the warlike tribes. He fortified the interior towns, opened arsenals and workshops, and expanded education. The French overpowered his forces and arrested him by 1846. Upon his parole in 1853, he chose a life of exile, eventually settling in Damascus. Revered for his exemplary life and ideals, in 1860 he showed himself to be a model of decency and probity when, at great risk to his own safety, he sheltered thousands of Christians during a Druze uprising. He died respected by both French and Algerians (and by many others throughout the world), and he remains the Algerian national hero.

Abdera \ab-'dir-3\ City of ancient Thrace on the Aegean Sea nearly opposite Thasos. First settled in the 7th century bc, it was colonized a second time c. 540 bc. A prosperous member of the Delian League, it was crippled in the 4th century bc by Thracian invasions. It was the home of Democritus and Protagoras.

abdominal cavity Largest hollow space of the body, between the diaphragm and the top of the pelvic cavity and surrounded by the spine and the abdominal muscles and others. It contains most of the alimentary canal, the liver and pancreas, the spleen, the kidneys, and the adrenal glands. It is lined by the peritoneum, a membrane covering the cavity’s inside wall (parietal peritoneum) and each organ or structure in it (visceral peritoneum). Disorders include ascites (fluid in the peritoneal cavity) and peritonitis.

abdominal muscle Any of the muscles of the front and side walls of the abdominal cavity. Three flat layers — the external oblique, internal oblique, and transverse abdominis muscles — extend from each side of the spine between the lower ribs and the hipbone. The abdominal muscles attach to aponeuroses, connective tissue sheaths that merge toward the midline, sheathing the rectus abdominis muscle on each side of the midline. The abdominal muscles support and protect the internal organs and take part in exhaling, coughing, urinating, defecating, childbirth, and motion of the trunk, groin, and lower limbs.

‘Abduh Vab-diiV, Muhammad Egyptian religious scholar, jurist, and liberal reformer. As a student in Cairo, he came under the influence of Jamal al-Din al- Afghani. He was exiled for political radicalism (1882-88); he began his judicial career when he returned to Egypt. He rose from judge to mufti (legal counselor) in 1899. In his Treatise on the Oneness of God, he argued that Islam was superior to Christianity because it was more receptive to science and civilization. He liberalized Islamic law and

administration, promoting considerations of equity, welfare, and common

sense, even when this meant disregarding the literal texts of the Qur’an.

Abdul Kalam, A(vul) P(akir) J(ainulabdeen) (b. Oct. 15, 1931, Rameswaram, India) Indian president (from 2002). After graduating from the Madras Institute of Technology, Kalam played a leading role in the development of India’s missile and nuclear weapons programs. He planned a program that produced a number of successful missiles, helping earn him the nickname “Missile Man.” Beginning in the early 1990s, he also served as scientific adviser to the government, and his prominent role in India’s 1998 nuclear weapons tests established Kalam as a national hero. In 2002 the pro-Hindu National Democratic Alliance nominated Kalam, a Muslim, to succeed outgoing President K.R. Narayanan. Kalam easily won the elections in 2002, and in the largely ceremonial post he sought to use science and technology to transform India into a developed country.

Abdul-Jabbar X.ab-dol-jo-'barX,

Lew(is) Alcindor (b. April 16,

1947, New York, N.Y., U.S.) U.S. basketball player. During his college career at UCLA, the team lost only two games, and he led it to three national championships (1966-68).

He then joined the Milwaukee Bucks; in 1975 he was traded to the Los Angeles Lakers. Standing 7 ft l 3 /8 in. (2 m 17 cm), he was the dominant centre of his time and helped his teams to six NBA titles. By the time he retired in 1989, he had scored a record 38,387 points. He also set the record for most field goals (15,837) and most minutes played (57,446).

He was voted Most Valuable Player a record six times.

Abdul Rahman Putra Alhaj

Vab-dul-ra-'man-'put-ro-al-'hajV Prince (b. Feb. 8, 1903, Alor Star,

Kedah, Malaya — d. Dec. 6, 1990,

Kuala Lumpur, Malaysia) First prime minister of independent Malaya (1957-63) and then of Malaysia (1963-70). He was educated in England and served in the Malayan Federal Legal Department (1949-51) before pursuing a career in politics. As president of the United Malays National Organization, Abdul Rahman brought Chinese and Indian political groups into the Alliance Party, which won an overwhelming majority in the 1955 election. He negotiated for Malayan independence from Britain (achieved in 1957); the federation of Malaysia was formed in 1963.

Abdulhamid V.ab-dol-ha-'medV II (b. Sept. 21, 1842, Constanti-

nople — d. Feb. 10, 1918, Constantinople) Sultan (1876-1909) of the Ottoman Empire under whose rule the Tanzimat reform movement reached its climax. After initially promoting the first Ottoman constitution (primarily to ward off foreign intervention), he suspended it 14 months later and ruled thereafter as a despot. He used Pan-Islamism to rally Muslim opinion outside his empire; the Hejaz Railway was built with foreign contributions. Discontent with his absolutist rule and resentment over European intervention in the Balkans resulted in his overthrow by the Young Turks in 1908. See also Mustafa Kemal Ataturk; Enver Pasha; Midhat Pasha.

Abdullahi See Abd Allah
Abel See Cain and Abel

Abelard, Peter (b. 1079, Le Pallet, near Nantes, Brittany — d. April 21, 1142, Priory of Saint-Marcel, near Chalon-sur-Saone, Burgundy) French theologian and philosopher. The son of a knight, he abandoned his inheritance to study philosophy. He became private tutor to Heloi'se, niece of a canon in Paris, c. 1114. They fell in love; Heloi'se became pregnant, and they married secretly. Her uncle had Abelard castrated, after which he became a monk and Heloi'se became a nun. Abelard’s Theologia was condemned as heretical in 1121. He accepted election as abbot of a monastery in Brittany in 1125, but his relations with the community deteriorated and he had to flee for his life. From c. 1135 Abelard taught at Mont-

Kareem orig. (Ferdinand)

Kareem Abdul-Jabbar, 1 987.

STEPHEN DUNN/GETTY IMAGES

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Sainte-Genevieve, where he wrote Ethica, in which he analyzed the notion of sin. In 1140 he was again condemned for heresy, and he withdrew to the monastery at Cluny. His influential Sic et non, a collection of apparently contradictory writings by church fathers on various topics, was intended to bring readers to the truth by wrestling with divergent opinions. He also wrote an autobiography, Historia calamitatum, and his best-known work is the series of letters he exchanged with Heloi'se after they retired to monasteries.

Abenaki \,a-b3-'na-ke\ or Abnaki Confederacy of Algonquian-speaking North American Indian peoples living mostly in Quebec, Can., and Maine, U.S. The contemporary Abenaki consider their home territory to be southern Quebec and the U.S. states of Vermont and New Hampshire, as well as parts of Maine and New York. Their name means “people

of the dawn" or "easterners." The name is applied to a number of groups — including Androscoggin, Kennebec, Maliseet, Ouarastegouiak, Passamaquoddy, Patsuiket, Penobscot, Pigwacket, Micmac, Pennacook, Rocameca, Sokoni, and Wewenoc — who formed the Abenaki confederation in order to resist the Iroquois Confederacy, especially the Mohawk. In the 17th century the Abenaki sided with the French against the English, but, after severe defeats, they withdrew to Canada, many eventually settling at Saint-Frangois-du-Lac and Becancour, near Trois-Rivieres, in Quebec. There are also reservations in Maine and in New Brunswick, Can. The total population of Abenaki is about 12,000.

Abeokuta ya-'ba-o-.kii-taX City (pop., 2002 est.: 529,700), southwestern Nigeria. Located about 50 mi (80 km) north of Lagos, Abeokuta was established c. 1830 as a refuge from intertribal wars. It was the chief town of the Egba, who long maintained a working relationship with the British; not until 1914 was it incorporated into British Nigeria. The modem town is an agricultural and exporting centre.

Aberdeen City, council area (pop., 2001: 212,125), and commercial port on the North Sea, eastern Scotland. It constitutes the council area of Aberdeen, an enclave within the surrounding council area of Aberdeenshire, which was also the name of the historic county of which Aberdeen was the seat. Situated at the mouths of the Rivers Dee and Don, it is the chief port of northern Scotland. It was a royal burgh from the 12th century and a Scottish royal residence in the 12th- 14th centuries. It supported Robert the Bruce in wars for Scottish independence, and for a time it was the headquarters of Edward I. From the 1970s Aberdeen developed rapidly as the principal British centre of the North Sea oil industry and its associated service and supply industries.

Aberdeen, George Hamilton-Gordon, 4th earl of (b. Jan. 28, 1784, Edinburgh, Scot. — d. Dec. 14, 1860, London, Eng.) British foreign secretary and prime minister (1852-55). As special ambassador to Austria in 1813, he helped form the coalition that defeated Napoleon. As foreign secretary (1828-30, 1841-46), he settled boundary disputes between Canada and the U.S. with the Webster- Ashburton Treaty and the Oregon Treaty (see Oregon Question). As prime minister, he formed a coalition government, but his indecision hampered peacekeeping efforts and led to Britain's involvement in the Crimean War. Constitutionally responsible for the mistakes of British generals in the war, he resigned in 1855.

Aberhart Va-bor-.hartV William (b. Dec. 30, 1878, Kippen, Ont., Can. — d. May 23, 1943, Vancouver, B.C.) Canadian politician and the country's first Social Credit Party premier (Alberta, 1935-43). Aberhart was a high school principal in Calgary, Alta. (1915-35). An active lay preacher, he founded the Calgary Prophetic Bible Institute (1918). In 1932 he used his evangelical rhetoric to promote monetary-reform theories to solve the economic problems created in Alberta by the Great Depression, proposing to issue dividends (social credit) to each person, based on the real wealth of the province. When his party won a majority in the 1935 provincial election, he became premier and minister of education, but his social-credit proposals were disallowed by the federal government.

Abernathy \'ab-3r-,nath-e\, Ralph David (b. March 11, 1926, Linden, Ala., U.S. — d. April 17, 1990, Atlanta, Ga.) U.S. pastor and civil rights leader. He was educated at Alabama State University and Atlanta University. Ordained a Baptist minister in 1948, he became pastor of the First Baptist Church in Montgomery, Ala., in 1951. He met Martin Luther

King, Jr., a few years later when the latter became pastor of another Baptist church in Montgomery. In 1955-56 the two men organized a nonviolent boycott of the city bus system, marking the beginning of the U.S. CIVIL rights movement. In 1957 they founded the Southern Christian Leadership Conference. Abernathy became its president on King's assassination in 1968; in 1977 he resigned to resume work as a pastor in Atlanta. His autobiography, And the Walls Came Tumbling Down, appeared in 1989.

aberration Deviation of light rays by LENSes or curved mirrors which causes the images to be blurred. Spherical aberration occurs because curvature in a lens or mirror causes rays falling on the outer edges to be brought to a focus at a different point than those falling on the middle. This makes the images formed appeal - blurred. Chromatic aberration, which occurs in lenses but not mirrors, is the failure of a lens to focus all colours (wavelengths) of light in the same plane; the image appears blurred and shows rainbow-coloured fringes around the edges. See also astigmatism.

aberration of starlight Apparent displacement of a star or other celestial body resulting from Earth's orbital motion around the Sun. The maximum displacement is about 20.49 seconds of arc. It depends on the ratio of Earth's orbital speed to the speed of light and Earth's direction of motion and thus provides confirmation that Earth orbits the Sun rather than the reverse.

Aberystwyth X.a-bo-'ris-.twithX Town (pop., 1991: 11,154) on Cardigan Bay, western Wales. The medieval walled town was built around a 13th-century fortress. It later became the exporter for the once-flourishing local lead mines. A principal stronghold of Welsh culture, it has grown as a seaside resort.

Abhayagiri \ab-'ya-go-re\ Theravada Buddhist monastic center built at Anuradhapura, then capital of Ceylon, by King Vattagamani Abhaya (r. 29-17 bc). Originally associated with the nearby Mahavihara ("Great Monastery"), it soon seceded in a dispute over the relations between monks and the lay community and the use of Sanskrit works to augment Pali texts as scripture. It gained wealth and power under the patronage of Gajabahu I (ad 1 13-35) and flourished until Anuradhapura was abandoned in the 13th century. Two of its main colleges operated into the 16th century.

Abhidhamma Pitaka V.a-bi-'da-mo-'pe-ta-koX Third and latest collection of texts comprising the Pali canon (see Tripitaka) of Theravada Buddhism. The first two collections, Sutta Pitaka and Vinaya Pitaka, are attributed to the Buddha. Abhidhamma Pitaka texts are ascribed to later disciples and scholars; they deal with ethics, psychology, and epistemology.

Abhidharmakosa V.a-bi-.dar-mo-'ko-ssX Buddhist scholarly work that provides an introduction to the seven Abhidharma treatises in the Sarvastivada canon and a digest of their contents. It was composed by the Buddhist monk Vasubandhu (fl. 4th or 5th century), who lived in northwestern India. It systematizes Sarvastivada doctrine and shows the influence of Mahayana, to which Vasubandhu later converted. It provides much information on doctrinal differences among the ancient Buddhist schools.

abhijna \3-'bij-n3\ In Buddhist philosophy, the miraculous powers obtained through meditation and wisdom. They include the ability to travel any distance or take any form at will, to see everything, to hear

everything, to read minds, and to recall former existences. A sixth miraculous power, available only to Buddhas and arhats (saints), is freedom by undefiled wisdom (Enlightenment). The powers are signs of spiritual progress but their indulgence is a distraction from the path toward Enlightenment.

Abidjan \,a-be-'jan\ Largest city (pop., 1999 est.: 3,199,000) and chief port of Cote d’Ivoire. Abidjan was a rail terminus from 1904; after its lagoon was opened to the sea to create a port (1950), the city became the financial centre of French West Africa. Though it was once the country’s capital and remains its seat of government, the official capital was moved to Yamoussoukro in 1983. Abidjan has a museum of traditional Ivorian art, a national library, and several research institutes.

Abilene Town (pop., 2000: 6,543), Kansas, U.S. It lies on the Smoky Hill River east of Salina. Settled in 1858, it gained importance when it became the railway terminus for overland Texas cattle drives. With the prosperity of the cattlemen came an era of lawlessness; Wild Bill Hickok was its marshal in 1871. Pres. Dwight D. Eisenhower spent his boyhood there and is buried at the Eisenhower Center, which includes his family home and library.

Abilene City (pop., 2000: 115,930), west-central Texas, U.S. Founded in 1881 as the new railhead for the overland Texas cattle drives, it took the business of the previous railhead, Abilene, Kan. It is the site of several educational institutions, the West Texas Fair, and the reconstructed Old Abilene Town.

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Abnaki See Abenaki

abnormal psychology or psychopathology Branch of psychology. It is concerned with mental and emotional disorders (e.g., NEUROSIS, psychosis, mental deficiency) and with certain incompletely understood normal phenomena (such as dreams and hypnosis). The chief tool used in classifying psychological disorders is the American Psychiatric Assn.’s Diagnostic and Statistical Manual of Mental Disorders 4th edition (DSM - IV).

ABO blood-group system Classification of human blood according to whether red blood cells (erythrocytes) have or lack the inherited antigens called A (including A1 and A2) and B on their surface. Blood can be type O (lacking both), type A (having only A), type B (having only B), or type AB (having both). The ABO antigens make certain blood types incompatible for transfusion. They are developed well before birth and remain through life. The frequencies of blood groups vary among different racial groups and in different geographic areas. Certain diseases are rarer in persons with particular blood groups.

abolitionism (c. 1783-1888) Movement to end the slave trade and emancipate slaves in western Europe and the Americas. The slave system aroused little protest until the 18th century, when rationalist thinkers of the Enlightenment criticized it for violating the rights of man, and Quaker and other evangelical religious groups condemned it as un-Christian. Though antislavery sentiments were widespread by the late 1 8th century, they had little immediate effect on the centres of slavery themselves — the West Indies, South America, and the southern U.S. In 1807 the importation of African slaves was banned in the U.S. and the British colonies. Slavery was abolished in the British West Indies by 1838 and in the French possessions 10 years later. In the 11 Southern states of the U.S., however, slavery was a social and economic institution. American abolitionism laboured under the handicap that it threatened the harmony of North and South in the Union, and it also ran counter to the U.S. Constitution, which left the question of slavery to the individual states. The abolitionist movement in the North was led by agitators such as William Lloyd Garrison, founder of the American Anti-Slavery Society, writers such as John Greenleaf Whittier, former slaves such as Frederick Douglass, and Harriet Beecher Stowe. The election of Abraham Lincoln, who opposed the spread of slavery to the West, marked a turning point in the movement. Convinced that their way of life was threatened, the Southern states seceded from the Union (see secession), which led to the American Civil War. In 1863 Lincoln (who had never been an abolitionist) issued the Emancipation Proclamation, which freed slaves held in the Confederate states; the 13th Amendment to the U.S. Constitution (1865) prohibited slavery throughout the country. Slavery was abolished in Latin America by 1888. In some parts of Africa and in much of the Islamic world, it persisted as a legal institution well into the 20th century.

Abominable Snowman Tibetan Yeti Mythical monster believed to inhabit the Himalayas near the snow line. The Yeti is thought to resemble an oversized man covered with shaggy fur. Reported sightings are rare; evidence of its existence consists largely of unusual footprints left in the snow, probably the tracks of bears. At certain gaits, bears place the hindfoot partly over the imprint of the forefoot, thus creating tracks that resemble the footprints of a very large primate heading in the opposite direction.

Aborigine See Australian Aboriginal

abortion Expulsion of a fetus from the uterus before it can survive on its own. Spontaneous abortion at earlier stages of pregnancy is called miscarriage. Induced abortions often occur through intentional medical intervention and are performed to preserve the woman’s life or health, to prevent the completion of a pregnancy resulting from rape or incest, to prevent the birth of a child with serious medical problems, or because the woman does not believe she is in a position to real' a child properly. The drug RU-486, if taken within a few weeks of conception, will trigger a miscarriage. Up to about 19 weeks of pregnancy, injections of saline solutions or hormones may be used to stimulate uterine contractions that will expel the fetus. Surgical removal of the contents of the uterus may be performed in the second trimester or later. Intact dilation and extraction procedures may occur in the third trimester; sometimes critically referred to as “partial-birth abortions,” they have been very controversial. Other abortion procedures include manual vacuum aspiration (extraction by manual syringe) and dilation and suction curettage (extraction by machine-operated suction), both of which can be performed in early preg-

nancy. The social acceptability of abortion as a means of population control has varied from time to time and place to place throughout history. It was apparently a common method of family limitation in the Greco-Roman world, but Christian theologians early and vehemently condemned it. It became widely accepted in Europe in the Middle Ages. Severe criminal sanctions to deter abortion became common in the 19th century, but in the 20th century those sanctions were gradually modified in many countries. In the U.S. the 1973 Roe v. Wade decision had the effect of legalizing abortion during the first three months of pregnancy; states were able to implement restrictions on access to abortion after the first trimester, though within constraints set by the courts. Since that decision, there has been a fierce debate between supporters and opponents of a liberalized abortion policy.

Abraham (fl. early 2nd millennium bc) First of the Hebrew patriarchs, revered by Judaism, Christianity, and Islam. Genesis tells how Abraham, at 75, left Ur with his barren wife, Sarai (later Sarah), and others to found a new nation in Canaan. There God made a covenant with him, promising that his descendants would inherit the land and become a great nation. Abraham fathered Ishmael by Sarah's maidservant Hagar; Sarah herself bore Isaac, who inherited the covenant. Abraham's faith was tested when God ordered him to sacrifice Isaac; he was prepared to obey but God relented. In Judaism he is a model of virtue, in Christianity he is the father of all believers, and in Islam he is an ancestor of Muhammad and a model (in Sufism) of generosity.

Abraham, Karl (b. May 3, 1877, Bremen, Ger. — d. Dec. 25, 1925, Berlin) German psychoanalyst. He helped establish the first branch of the International Psychoanalytic Institute in 1910 and pioneered the psychoanalytic treatment of manic-depressive psychosis (bipolar disorder). He suggested that the sexual drive develops in six stages and that if development is arrested at any of the earlier stages, mental disorders will likely result from fixation at that level. His most important work was A Short Study of the Development of the Libido (1924).

Abraham, Plains of Plateau located west of the old walled city of Quebec, Canada. On Sept. 13, 1759, it was the scene of the decisive battle of the French and Indian War, in which the British under James Wolfe defeated the French under the marquis de Montcalm. U.S. forces held the plateau (1775-76) in their siege of Quebec during the American Revolution. It is now a park within Quebec city limits.

abrasion platform See wave-cut platform

abrasives Sharp, hard materials used to wear away the surface of softer, less resistant materials. Abrasives are indispensable to the manufacture of the highly precise components and ultrasmooth surfaces required in the manufacture of automobiles, airplanes and space vehicles, mechanical and electrical appliances, and machine tools. Abrasives may be natural (e.g., diamond, corundum, emery) or synthetic (e.g., silicon carbide or Carborundum, synthetic diamond, alumina — a synthetic form of corundum). They range from the relatively soft particles used in household cleansers and jeweler's polish to diamonds.

Abruzzo \a-'briit-s6\ or Abruzzi \a-'brut-se\ Region (pop., 2004 est.: 1,285,896), central Italy. Its capital is L'Aquila. Most of the region is mountainous or hilly, traversed by the Apennines. The ancient Italic tribes of the

region long resisted conquest by the Romans. The Normans established themselves in the 12th century, and the region later sided with the Hohenstaufens against the papacy. As Abruzzi e Molise, the area became part of the Kingdom of Italy in 1860-61; in 1965 it was divided into the separate regions of Abruzzo and Molise. The economy is primarily agricultural.

Absalom (fl. c. 1020 bc, Palestine) In ancient Israel, the third and most beloved son of David. His story is told in 2 Samuel 13-19. An attractive but lawless man, he killed his half brother Amnon as revenge for the latter's rape of Tamar, Absalom's sister, and was banished from the kingdom for a time. He later raised a rebellion against his father, capturing Jerusalem but meeting defeat in the forest of Ephraim, where he was killed by his cousin Joab, who found him caught by the hair in an oak tree. Despite Absalom's treachery, David greatly lamented his son's death.

Absaroka \ab-'sar-3-k9\ Range Range of the Rocky Mountains in the U.S. It extends from southern Montana into northwestern Wyoming, crossing portions of Gallatin, Shoshone, and Custer national forests, as well as the northeastern portion of Yellowstone National Park. The range is about 175 mi (280 km) long; its highest point is Franks Peak, at 13,140 ft (4,005 m).

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abscess \'ab-,ses\ Localized collection of pus in a cavity in the deeper layers of the skin or within the body, formed from tissues broken down by white blood cells (leukocytes) in response to inflammation caused by bacteria. A wall develops, separating the thick yellowish pus from the extracellular fluid of nearby healthy tissues. Rupture of the abscess allows the pus to escape and relieves swelling and pain. Treatment consists of cutting into the wall to drain the pus and giving antibiotics. If infective contents enter the bloodstream, they may be carried to remote tissues, seeding new abscesses.

absentee ownership Ownership of land by those who do not live on it but who enjoy income from it. Criticized for centuries as an economic injustice, absentee ownership was a feature of pre-Revolutionary France and English rule of Ireland. Ending the practice continues to be a goal of LAND reform programs in many developing countries.

absolute value Measure of the magnitude of a real number, complex number, or vector. Geometrically, the absolute value represents (absolute) displacement from the origin (or zero) and is therefore always nonnegative. If a real number a is positive or zero, its absolute value is itself; if a is negative, its absolute value is -a. A complex number z is typically represented by an ordered pair (a, b) in the complex plane. Thus, the absolute value (or modulus) of z is defined as the real number Vr / 2 + b 2 , which corresponds to z ' s distance from the origin of the complex plane. Vectors, like arrows, have both magnitude and direction, and their algebraic representation follows from placing their "tail" at the origin of a multidimensional space and extracting the corresponding coordinates, or

components, of their “point.” The absolute value (magnitude) of a vector is then given by the square root of the sum of the squares of its components. For example, a three-dimensional vector v, given by (a , b, c), has absolute value Va 2 + b 2 + c 2 . Absolute value is symbolized by vertical bars, as in \x\, \z\, or |v|, and obeys certain fundamental properties, such as \a ■ b\ = \a\ • \b\ and \a + b\ < \a\ + \b\.

absolute zero Temperature at which a thermodynamic system (see thermodynamics) has the lowest energy, 0 kelvin (K). It corresponds to -459.67°F (-273.15°C) and is the lowest possible temperature theoretically achievable by a system. A gas at constant pressure contracts as the temperature is decreased. A perfect gas would reach zero volume at absolute zero. However, a real gas condenses to a liquid or a solid at a temperature higher than absolute zero. At absolute zero, the system’s molecular energy is minimal and none is available for transfer to other systems. The Kelvin temperature scale has absolute zero as its zero point, and its fundamental unit is the kelvin.

absolution In Christianity, a pronouncement of forgiveness of sins made to a person who has repented. This rite is based on the forgiveness that Jesus extended to sinners during his ministry. In the early church, the priest absolved repentant sinners after they had confessed and performed their penance in public. During the Middle Ages, it became the custom for priests to hear confession and grant absolution privately. In Roman Catholicism penance is a sacrament, and the priest has the power to absolve a contrite sinner who promises to make satisfaction to God. In Protestant churches, the confession of sin is usually made in a formal prayer by the whole congregation, after which the minister announces their absolution.

absolutism Political doctrine and practice of unlimited, centralized authority and absolute sovereignty, especially as vested in a monarch. Its essence is that the ruling power is not subject to regular challenge or check by any judicial, legislative, religious, economic, or electoral agency. Though it has been used throughout history, the form that developed in early modern Europe (16th— 1 8th century) became the prototype; Louis XIV is seen as the epitome of European absolutism. Religious authority was assumed by the monarch, who became the head of the church as well as the state, on the basis that the right to rule came from God (see divine kingship). See also AUTHORITARIANISM, dictatorship, totalitarianism.

absorption Transfer of energy from a wave to the medium through which it passes. The energy of the wave can be reflected, transmitted, or absorbed. If the medium absorbs only a fraction of the energy, it is said to be transparent to that energy. When all energy is absorbed, the medium is opaque. All substances absorb energy to some extent. For instance, the ocean appears transparent to sunlight near the surface, but becomes opaque with depth. Substances absorb specific types of radiation. Rubber is transparent to infrared radiation and X rays, but opaque to visible light.

Green glass is transparent to green light but absorbs red and blue light. Absorption of sound is fundamental to acoustics; a soft material absorbs sound energy as the waves strike it.

abstract art or nonobjective art or nonrepresentational art

Art, including painting, sculpture, and graphic art, that does not represent recognizable objects. In the late 19th century the traditional European

conception of art as the imitation of nature was abandoned in favour of the imagination and the unconscious. Abstraction developed in the early 20th century with such movements as Fauvism, Expressionism, Cubism, and Futurism. Vasily Kandinsky is credited as the first modern artist to paint purely abstract pictures, c. 1910. Piet Mondrian's De Stijl group in The Netherlands widened the spectrum c. 1915-20. Abstraction continued to flourish between the two world wars, and after the 1930s it was the most characteristic feature of Western art. After World War II, Abstract Expressionism emerged in the U.S. and had a great influence on European and American painting and sculpture. By the turn of the 21st century, artistic output was varied, with abstract art prominent alongside figurative and conceptual work.

Abstract Expressionism Movement in U.S. painting that began in the late 1940s. Its development was influenced by the radical work of Arshile Gorky and Hans Hofmann and by the immigration in the late 1930s and early '40s of many European avant-garde artists to New York. The Abstract Expressionist movement itself is generally regarded as having begun with the paintings done by Jackson Pollock and Willem de Kooning in the late 1940s and early '50s. Other artists who came to be associated with the style include Franz Kune, Mark Rothko, Clyfford Still, Philip Guston, Helen Frankenthaler, Barnett Newman, Adolph Gottlieb, Robert Motherwell, Lee Krasner, and Ad Reinhardt. The movement comprised many styles but shared several characteristics. The works were usually abstract (i.e., they depicted forms not found in the natural world); they emphasized freedom of emotional expression, technique, and execution; they displayed a single unified, undifferentiated field, network, or other image in unstructured space; and the canvases were large, to enhance the visual effect and project monumentality and power. The movement had a great impact on U.S. and European art in the 1950s; it marked the shift of the creative centre of modem painting from Paris to New York. See also ABSTRACT ART; ACTION PAINTING.

Abu al-Hasan al-Ash'arl See Aba al-Hasan al-AsH c ARi

AbG 'All Hasan ibn 'All See Nizam al-Mulk

Abu Bakr \9-,bu-'ba-k3r\ (b. c. 573, Mecca, Hejaz, Arabian Peninsula — d. Aug. 23, 634, Medina) One of the close Companions of the Prophet Muhammad and the first Muslim caliph. Some Muslim traditions say he was the first male convert to Islam after Muhammad. He became caliph after Muhammad's death in 632, and during his two years in that office he consolidated central Arabia under Muslim control, engaging in the wars of apostasy (riddah). He also realized the urgency of expanding the regions under Muslim control in order to maintain peace among Arab tribes.

Abu Dhabi Arabic Abu ZabI City (pop., 1995: 398,695), capital of AbG ZabI emirate and national capital of the United Arab Emirates. It occupies most of the small island of Abu ZabI, which is connected to the mainland by a bridge. Settled in 1761, it was of little importance until the discovery of oil in 1958. Oil royalties thereafter revolutionized its political and economic position, and it has grown into a modem city.

AbO HanTfah \3-,bu-ha-'ne-f3\ (al-Nu'mdn ibn Thabit) (b. 699, Kufah, Iraq — d. 767, Baghdad) Muslim jurist and theologian. The son of a merchant in Kufah, he gained wealth in the silk trade and studied law under the noted jurist Hammad. After Hammad's death (738), Abu Hanl-

fah became his successor. He was the first to develop systematic legal doctrines from the accumulated Islamic legal tradition. Primarily a scholar, he neither accepted a judgeship nor took direct part in court politics; he supported the successors of c Au over the ruling Umayyad and 'Abbasid dynasties. His doctrinal system became one of four canonical schools of Islamic law (Sharia) and is still widely followed in India, Pakistan, Turkey, Central Asia, and Arab countries.

Abu Muslim Ya-.bu-'mus-limX (d. 755) Leader of a revolutionary movement in Khorasan whose efforts brought down the Umayyad dynasty. Born into the mawali (non- Arab Muslim) class and of humble origins, he met an agent of the 'Abbasid family while in prison (741). After his arranged release, he was sent to Khorasan (745-746) to instigate a revolt. Recruit-

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ing from various discontented groups, he succeeded in overthrowing the last Umayyad caliph, Marwan II (750), and was rewarded with the governorship of Khorasan. His popularity led the second 'Abbasid caliph, al-Mansur, to view him as a threat and have him put to death. See also ‘Abbasid dynasty.

AbQ Qir \,a-bu-'ker\ Bay Inlet of the Mediterranean Sea, lying near the Rosetta mouth of the Nile along the coast of Egypt. It was the scene of the Battle of the Nile (1798), in which an English fleet under Horatio Nelson defeated the French fleet of Napoleon I.

Abu Simbel Site of two temples built by Ramses II in the 13th century bc. The area, at the southern frontier of pharaonic Egypt, lies near Egypt’s current border with The Sudan. The temples were unknown to the outside world until their rediscovery in 1813.

The larger temple displays four 67-ft (20-m) seated figures of Ramses; the smaller was dedicated to Queen Nefertari. When the reservoir created by the building of Aswan High Dam threatened to submerge the site in the early 1960s, an international team disassembled both temples and reconstructed them 200 ft (60 m) above the riverbed.

Abu Zabi or Abu Dhabi Largest constituent emirate (pop., 2003 est.: 1,591,000) of the United Arab Emirates. Bounded to the north and west by the Persian Gulf, to the south

and southwest by Saudi Arabia, and to the east by Oman, it has an area of 28,210 sq mi (73,060 sq km). It has numerous offshore islands, and internally it partially surrounds Dubayy and has a short boundary with Al-Shariqah (Sharjah). Since the 18th century the A1 Bu Falah, a clan of the Banu Yas confederation, has held power. In 1761 they found wells of potable water at the site of Abu Dhabi city, and they made their headquarters there from 1795. In the 19th century territorial conflicts with Muscat (Masqat) and Oman and with the ancestors of the Sa‘0d dynasty (which now rules Saudi Arabia) led to border disputes that have remained largely unsettled. Abu Zabi signed an agreement with Great Britain in 1892, placing its foreign affairs under British control. When Britain withdrew from the Persian Gulf in 1968, the emirate and the other Trucial States formed the United Arab Emirates. Its rich oil fields make it and Dubayy the federation’s two most prosperous emirates.

Abu Zayd \ab-u-'zid\, Nasr Hamid (b. Oct. 7, 1943, Tanta, Egypt) Egyptian scholar. He attended Cairo University and received a Ph.D. in Arab and Islamic studies. His research and writings on Quranic exegesis, including his well-known Critique of Islamic Discourse (1995), offended some Islamic fundamentalists. In 1993 a colleague denounced him in a major Cairo mosque, and Islamic radicals successfully sought a nullification of his marriage from an Egyptian family court on the grounds that his writings demonstrated his apostasy (and under Egyptian law a Muslim woman may not be married to a non-Muslim man). Though the court declined to pass judgment, an appeals court divorced Abu Zayd and his wife, a decision confirmed by the Egyptian Supreme Court. The case attracted widespread concern among intellectuals and human rights groups. Since 1995 Abu Zayd and his wife have lived in exile in The Netherlands.

Abuja \a-'bii-ja\ City (pop., 2003 est.: 452,000), federal capital of Nigeria. Construction of the city, at a site chosen for its healthful climate and central location about 300 mi (480 km) northeast of Lagos, began in 1976 under the architect Tange Kenzo. It officially replaced Lagos as the capital in 1991.

Abydos \3-'bi-d9s\ Sacred city, one of the most important archaeological sites of ancient Egypt. It was a royal necropolis of the first two dynasties and later a pilgrimage centre for the worship of Osiris. The pharaohs, including Thutmose III and Ramses III, embellished the temple to Osiris, and some pharaohs had cenotaphs at Abydos. The temple of Seti I, one of the most beautiful, has helped decode Egyptian history: in a long gallery is a

relief, the so-called Abydos list of kings, showing Seti and his son Ramses making offerings to the cartouches of 76 dead predecessors.

Abydos Ancient Anatolian town northeast of modern Qanakkale, Turkey, on the eastern side of the Dardanelles. It was colonized c. 670 bc by the Milesians (see Miletus). Xerxes I crossed the strait on a bridge of boats to invade Greece in 480 bc. Abydos is celebrated for its resistance to Philip V of Macedon in 200 bc and for the legend of Hero and Leander.

abyssal plain \3-'bis-3l\ Flat seafloor area at a depth of 10,000-20,000 ft (3,000-6,000 m), generally adjacent to a continent. The larger plains are hundreds of miles wide and thousands of miles long. The plains are largest and most common in the Atlantic Ocean, less common in the

Indian Ocean, and even rarer in the Pacific Ocean, where they occur mainly as small, flat floors of marginal seas or as long, narrow bottoms of trenches. They are thought to be the upper surfaces of land-derived sediment that accumulates in abyssal depressions.

Abyssinia See Ethiopia

Abyssinian cat \,ab-3-'si-ne-3n\ Breed of domestic cat, considered more similar to the sacred cat of ancient Egypt than any other living cat. It is lithe and has slender legs and a long, tapering tail. Its short, finely textured coat is ruddy reddish brown, with individual hairs distinctively ticked, or tipped, with bands of black or brown. The nose is red, and the tail tip and backs of the hindlegs are black. The Abyssinian is affectionate and quiet, though generally shy with strangers.

Abzug \'ab-zog\, Bella orig. Bella Savitzky (b. July 24, 1920, New York, N.Y., U.S.— -d. March 31, 1998, New York City) U.S. lawyer and politician. She studied law at Columbia University and subsequently took on numerous union, civil liberties, and civil rights cases, representing several people charged by Sen. Joseph McCarthy. She founded and chaired (1961-70) the antiwar Women Strike for Peace and later the National Women's Political Caucus. In the House of Representatives (1971-77), she was known for her flamboyant style, her opposition to the Vietnam War, and her outspoken support for the Equal Rights Amendment, abortion rights, and child-care legislation.

AC See ALTERNATING CURRENT

acacia \o-'ka-sh3\ Any of the approximately 800 species of trees and shrubs that make up the genus Acacia, of the mimosa family. Acacias are native to tropical and subtropical regions of the world, particularly Australia and Africa. Sweet acacia (A. farnesiana) is native to the southwestern U.S. Acacias have distinctive, finely divided leaflets, and their leafstalks may bear thorns or sharp spines at their base. Their small, often fragrant, yellow or white flowers have many stamens apiece, giving each a fuzzy appearance. On the plains of southern and eastern Africa, acacias are common features of the landscape. Several species are important economically, yielding substances such as gum arabic and tannin, as well as valuable timber.

academic degree See academic

DEGREE

Academie Francaise \a-ka-da-'me-fra n -'sez\ Literary academy in France. The Academie Frangaise was established by Cardinal Richelieu in 1634 to maintain standards of liter-

ary taste and to establish the literary language. In modern times it has endeavoured (somewhat absurdly) to purify French of foreign loanwords. Its membership is limited to 40. Despite its conservatism, most of France's great writers, including Pierre Corneille, Jean Racine, Voltaire, and Victor Hugo, have been members.

academy Society of learned individuals organized to advance art, science, literature, music, or some other cultural or intellectual area of endeavour. The word comes from the name of an olive grove outside

Sandstone figures of Ramses II in front of the main temple at Abu Simbel near Aswan, Egypt.

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ancient Athens, the site of Plato's famous school of philosophy in the 4th century bc. Academies appeared in Italy in the 15th century and reached their greatest influence in the 17th– 1 8th centuries. Their purpose generally was to provide training and, when applicable, to create exhibiting or performance opportunities for their members or students. Most European countries now have at least one academy sponsored by or otherwise connected with the state. See also Academie Francaise.

Academy Awards Annual awards of merit in the U.S. presented by the Academy of Motion Picture Arts and Sciences. The Academy was formed in 1927 by Louis B. Mayer and others to raise the standards of film production, and its first awards were presented in 1929. The awards (nicknamed Oscars) recognize excellence in acting, directing, screen writing, and other activities related to film production.

Acadia North American possession of France in the 17th– 18th century, centred in what is now Nova Scotia. Acadia was probably intended to include the other present Maritime Provinces as well as parts of Maine and Quebec. The first European settlement was founded by Samuel de Champlain and Pierre du Cast in 1604. The area at times was also claimed by the British and was contested often in the 18th-century colonial wars; in 1713 Nova Scotia came under British rule. In 1755 many French-speaking Acadians were deported by the British because of imminent war with France; several thousand settled in French-ruled Louisiana, where their descendants were known as Cajuns. The event was the theme for Henry W. Longfellow's Evangeline.

Acadia National Park Preserve on the coast of Maine, U.S. It has an area of 65 sq mi (168 sq km). Originally established as Sieur de Monts

National Monument (1916), it became the first national park in the eastern U.S. as Lafayette National Park (1919) and was renamed Acadia in 1929. It consists mainly of a forested area on Mount Desert Island, dominated by Cadillac Mountain.

Acadia University Privately endowed university in Wolfville, Nova Scotia, Canada. Founded in 1838, it took its current name and status in 1891. It has faculties of arts, professional studies, science, theology, education, and graduate studies. Acadia ranks among the country’s top undergraduate institutions.

Acadian orogeny Vo-'ka-de-on-o-'ra-jo-neV Mountain-building event that affected the northern portion of the Appalachian Geosyncune from present-day New York to Newfoundland during the Devonian period. The orogeny was most intense in northern New England. Its origin has been ascribed to the collision of the northeastern portion of the North American Plate with western Europe. Evidence for the orogeny includes deformation of pre-Devonian and Devonian rocks.

acanthus \3-'kan-thos\ Any of the more than 2,500 plant species that make up the family Acanthaceae, of the figwort order. Acanthus are found mostly in tropical and subtropical regions. Most are herbaceous plants or shrubs that grow in tropical rainforests; some are climbers (vines) or trees. Acanthus have simple leaves arranged in opposite pairs on the twigs and enlarged cells called cystoliths in streaks or protuberances in the vegetative parts. The bisexual flowers are bilaterally symmetrical and usually crowded together in clusters. Individual flowers are enclosed by leaflike bracts, which are often coloured and large. Acanthus are mainly of horticultural interest and include some ornamentals.

Acapulco in full Acapulco de Juarez City and port (pop., 2000: 619,253), southwestern Mexico. Situated on a deep semicircular bay, it has the best harbour on Mexico’s Pacific coast. It was discovered by Hernan Cortes in 1531, and a settlement was founded in 1550. Until 1815 it was a main depot for Spanish colonial fleets going to the Far East. It has become a major international resort for tourists attracted by its scenic beauty, climate, and excellent beaches.

Acarnania V.a-kor-'na-ne-oV District, ancient Greece, bounded by the Ionian Sea, the Ambracian Gulf, and the Achelous River. First settled in the 7th-6th centuries bc, it developed into a federal state by the late 5th century bc; its capital was Stratus. It later came under Athenian, Theban, and Macedonian rule. Part of Acarnania recovered its independence in 23 1 bc and began an alliance with Philip V of Macedon. Rome overthrew the Macedonian dynasty in 167 bc, and Acarnania survived until Augustus incorporated many Acamanians into his new city Nicopolis Actia.

acceleration Rate of change of velocity. Acceleration, like velocity, is a vector quantity: it has both magnitude and direction. The velocity of an

object moving on a straight path can change in magnitude only, so its acceleration is the rate of change of its speed. On a curved path, the velocity may or may not change in magnitude, but it will always change in direction, which means that the acceleration of an object moving on a curved path can never be zero. If velocity is stated in metres per second (m/s) and the time interval in seconds (s), then the units of acceleration are metres per second per second (m/s/s, or m/s 2). See also centripetal

ACCELERATION.

accelerator, particle See particle accelerator

accelerometer \ik- 1 se-b- , ra-m3-t3r\ Instrument that measures acceleration. Because it is difficult to measure acceleration directly, the device measures the force exerted by restraints placed on a reference mass to hold its position fixed in an accelerating body. The output is usually either a varying electrical voltage or displacement of a moving pointer over a fixed scale. Specially designed accelerometers are used in varied applications: control of industrial vibration test equipment, detection of earthquakes (seismographs), and input to navigational and inertial guidance systems.

accent In prosody, a rhythmically significant stress on the syllables of a verse, usually at regular intervals. Though the term is often used interchangeably with stress, some prosodists use accent to mean the emphasis determined by normal language usage and stress to mean emphasis determined by metrical pattern.

acceptance Short-term credit instrument consisting of a written order that requires a buyer to pay a specified sum to the seller at a given date, signed by the buyer as a promise to honor the obligation. Acceptances are often used in export/import transactions: an exporter may require a buyer to sign and return an acceptance, which the exporter can then sell to the bank at a discount, thereby obtaining payment promptly. The buyer then has until the bill’s maturity date to dispose of the goods and pay the promised sum (now owed to the bank). See also bill of exchange; promissory note.

acclimatization Any of numerous gradual, long-term responses of an individual organism to changes in its environment. The responses are more or less habitual and reversible should conditions revert to an earlier state. These criteria differentiate acclimatization from homeostasis; from growth and development (which cannot be reversed); and from evolutionary adaptation (which occurs in a population over generations). Acclimatization can occur in anticipation of a change and enable organisms to survive conditions beyond their natural experience. Examples include adaptations to seasonal changes and adjustments to changes in altitude.

accordion Portable musical instrument that uses a hand-pumped bellows and two keyboards to sound free reeds, small metal tongues that vibrate when air flows past them.

The keyboards on either side of the bellows effectively resemble individual reed organs. The right-hand keyboard plays the treble line or lines. Most of the keys on the left-hand (bass) keyboard sound three-note chords; “free-bass” accordions permit the playing of single-note lines. A prototype accordion, using buttons rather than keys, was patented in Berlin in 1822 by Friedrich Buschmann (also inventor of the harmonica). The instrument gained wide popularity in dance bands and as a folk instrument. See also concertina.

account payable Any amount owed as the result of a purchase of goods or services on a credit basis. Although a firm making a purchase issues no written promise of payment, it enters the amount owed as a current liability in its accounts. Companies often incur this type of short-term debt in order to finance their inventories, especially in industries where inventory turnover is rapid. See also account receivable.

account receivable Any amount owed to a business as the result of a purchase of goods or services from it on a credit basis. Although the firm making the sale receives no written promise of payment, it enters the amount due as a current asset in its books. Accounts receivable constitute a major portion of the assets of many companies, and they may even be sold or pledged as collateral to obtain loans. See also account payable; factoring.

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accounting Systematic development and analysis of information about the economic affairs of an organization. The actual recording and summarizing of financial transactions is known as bookkeeping. When the data thus produced are abstracted in reports (usually quarterly or annually) for the use of persons outside the organization, the process is called financial accounting. Three reports are typically generated in financial accounting: the balance sheet, which summarizes the firm’s assets and liabilities; the income statement, which reports the firm’s gross proceeds, expenses, and profit or loss; and the statement of cash flow, which analyzes the flow of cash into and out of the firm. The creation of reports (usually monthly) for internal planning and decision-making is called managerial accounting. Its aim is to provide managers with reliable information on the costs of operations and on standards with which those costs can be compared, to assist them in budgeting.

Accra Ya-kra, o-'kra\ Capital and largest city (pop., 2001 est.: 1,551,200) of Ghana, on the Gulf of Guinea. When the Portuguese first settled on the coast in 1482, the site was occupied by the Ga people. Three fortified trading posts were built 1650-80 by the Danes, the Dutch, and the British. The Danes and Dutch left the region in 1850 and 1872, respectively, and in 1877 Accra became the capital of the British Gold Coast colony. The city became Ghana’s administrative, economic, and educational centre after the country gained its independence in 1957. Tema, 17 mi (27 km) east, has taken over Accra’s former port functions.

acculturation See culture contact

accused, rights of the In law, the rights and privileges of a person accused of a crime. In most modem legal systems these include the presumption of innocence until proved guilty, trial by jury, representation by counsel, the right to present witnesses and evidence to establish one’s innocence, and the right to cross-examine one’s accusers. Also important

are a prohibition against an unreasonable search and seizure, the right to a speedy trial, and guarantees of freedom from double jeopardy and of the right to appeal. In the U.S. a person accused of a crime must be notified immediately of the right to secure counsel and the right to refuse to answer questions if answering might be incriminating (see Miranda v. Arizona).

acetaminophen Vs-.se-to-'min-o-fonV Drug used to relieve mild headache or muscle and joint pain and to reduce fever. An organic compund, it relieves pain by inhibiting prostaglandin synthesis in the central nervous system and reduces fever by acting on the temperature-regulating centre of the brain. Unlike aspirin, it has no anti-inflammatory effect. It also is much less likely to irritate the stomach and cause peptic ulcers, is not linked with Reye syndrome, and can be taken by persons using anticoagulants or allergic to aspirin. Overdosages can cause fatal liver damage. A common brand name in much of the world is Tylenol. See also ibuprofen.

acetate C 2 H 3 0 2 _ ion, a salt, ester, or acylal derived from acetic acid. Acetates are important in the biochemical synthesis of fats from carbohydrates in plants and animals. Industrially, metal acetates are used in printing, vinyl acetate in plastic production, cellulose acetate in photographic films and textiles (one of the first synthetic fibres, often called simply acetate), and volatile organic esters as solvents.

acetic acid \9-'se-tik\ Most important carboxylic acid (CH 3 COOH). Pure (“glacial”) acetic acid is a clear, syrupy, corrosive liquid that mixes readily with water. Vinegar is its dilute solution, from fermentation and oxidation (see oxidation-reduction) of natural products. Its salts and esters are acetates. It occurs naturally as a metabolic intermediate in body fluids and plant juices. Industrial production is either synthetic, from acetylene, or biological, from ethanol. Industrial chemicals made from it are used in printing and as plastics, photographic films, textiles, and solvents.

acetone \'a-s3-,t6n\ or dimethyl ketone Vdl-'me-thol-'ke-.tonX Simplest and most important ketone (CH 3 COCH 3). It is a colourless, flammable liquid, boiling at 133 °F (56.2 °C). Many fats, resins, and organic materials dissolve easily in it, so it is used to make artificial fibres, explosives, resins, paints, inks, cosmetics (including nail-polish remover), coatings, and adhesives. Acetone is used as a chemical intermediate in pharmaceuticals and many other compounds.

acetylcholine Ya-.se-fT-'ko-lenX Ester of choline and acetic acid, a neurotransmitter active at many nerve synapses and at the motor end plate of vertebrate voluntary muscles. It affects several of the body’s systems, including the cardiovascular system (decreases heart rate and contraction strength, dilates blood vessels), gastrointestinal system (increases peristalsis in the stomach and amplitude of digestive contractions), and urinary

system (decreases bladder capacity, increases voluntary voiding pressure). It also affects the respiratory system and stimulates secretion by all glands that receive parasympathetic nerve impulses (see autonomic nervous system). It is important in memory and learning and is deficient in the brains of those with late-stage Alzheimer disease.

acetylene or ethyne Ve-.thinV Simplest alkyne, C 2 H 2 . A colourless, flammable, explosive gas, it is used as a fuel in welding and cutting metals and as a raw material for many organic compounds and plastics. It is produced by reaction of water with calcium carbide, passage of a hydro-

carbon through an electric arc, or partial combustion of methane. Decomposing it liberates heat; depending on degree of purity, it is also an explosive. An acetylene torch reaches about 6,000 °F (3,300 °C), hotter than combustion of any other known gas mixture. See also hydrocarbon.

Achaean Any member of an ancient Greek people identified in Homer as those who, with the Danaoi and the Argeioi, attacked Troy. Some identify them with the Mycenaeans of the 14th— 1 3th century bc; others say that they arrived in the 12th-century Dorian invasions. They may have held power only a few generations before being replaced by the Dorians. Herodotus claims the later Achaeans of the northern Peloponnese (see Achaean League) were descended from these earlier Achaeans.

Achaean League \9-'ke-on\ 3rd-century bc confederation of towns of Achaea, an area in the northern Peloponnese of ancient Greece. Twelve cities had joined together by the 4th century bc to combat piracy, but they disbanded after the death of Alexander the Great. Ten cities renewed the league in 280 bc, later admitting non-Achaean cities to defend themselves against Macedonia, then Sparta, and finally Rome. Rome dissolved the league after defeating it in 146 bc. Later a smaller league was formed that existed into the Roman imperial age.

Achaemenian \,a-k3-'me-ne-3n\ dynasty (559-330 bc) Early Persian dynasty. It derives its name from Achaemenes, who is thought to have lived in the early 7th century bc. From his son Teispes were descended two lines of kings. The older line included Cyrus I, Cambyses I, Cyrus II (the Great), and Cambyses II; the junior line began with Darius I and ended with the death of Darius III after his defeat by Alexander the Great (330 bc). Its greatest rulers were Cyrus II (r. 559-c. 529 bc), who actually established the Persian empire and from whose reign it is dated; Darius I, who secured the borders from external threats; and Xerxes I, who completed many of Darius’s public works. At its height, the Achaemenian Empire reached from Macedonia to northern India and from the Caucasus Mountains to the Persian Gulf. The ruins of one of its capitals, Persepous, survive from its golden age.

Achebe \a-'cha-ba\, (Albert) Chinua(lumogu) (b. Nov. 16, 1930, Ogidi, Nigeria) Nigerian Igbo novelist. Concerned with emergent Africa at its moments of crisis, he is acclaimed for depictions of the disorientation accompanying the imposition of Western customs and values on traditional African society. Things Fall Apart (1958) and Arrow of God (1964) portray traditional Igbo life as it clashes with colonialism. No Longer at Ease (1960), A Man of the People (1966), and Anthills of the Savannah (1988) deal with corruption and other aspects of postcolonial African life. Home and Exile (2000) is in part autobiographical, in part a defense of Africa against Western distortions.

Achelous River V.a-ko-'lo-osX Longest river in Greece. It rises in the Pindus Mountains and flows south 140 mi (220 km) to the Ionian Sea. Hydroelectric dams harness its waters at Kastraki and Kremasta. In ancient mythology, Achelous was a protean river god, who was vanquished by Hercules.

Acheson Va-cho-sonN, Dean (Gooderham) (b. April 11, 1893, Middletown, Conn., U.S. — d. Oct. 12, 1971, Sandy Spring, Md.) U.S. secretary of state (1949-53). After graduating from Yale University and Harvard Law School, he practiced law in Washington, D.C. In 1941 he joined the State Department, where he later served as undersecretary

(1945-47). In 1947 he helped design the Truman Doctrine and the Marshall Plan. As secretary of state under Harry S. Truman, he promoted the formation of NATO and was a principal creator of U.S. foreign policy in the early years of the Cold War. During congressional hearings held by Sen. Joseph McCarthy, Acheson refused to fire any alleged subversives in the State Department, including Alger Hiss. He established the policies of nonrecognition of China and aid to the regime of Chiang Kai-shek in Taiwan, and he supported U.S. aid to the French colonial regime in Indo-

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china. After leaving office, he continued to advise successive presidents. His memoir Present at the Creation won a 1970 Pulitzer Prize.

Acheson, Edward Goodrich (b. March 9, 1856, Washington, Pa., U.S. — d. July 6, 1931, New York, N.Y.) U.S. inventor. He helped develop the incandescent lamp and in 1881 installed the first electric lights for Thomas Alva Edison in Italy, Belgium, and France. Attempting to produce artificial diamonds, he created instead the highly effective abrasive material Carborundum. He later found that the silicon vaporizes from Carborundum at 7,500 °F (4,150 °C), leaving graphitic carbon, and patented his GRAPHiTE-making process in 1896.

Acheulean \9-'shu-le-on\ industry Stone-tool industry of the Lower Paleolithic Period characterized by bifacial stone tools with round cutting edges and typified especially by an almond-shaped (amygdaloid) flint hand ax measuring 8-10 in. (20-25 cm) in length and flaked over its entire surface. Other implements include cleavers, borers, knives, and choppers. The name derives from the site near St.-Acheul, in northern France, where such tools were first discovered. Acheulean industry was extremely long-lived (1,500,000-110,000 years ago) and is associated with both Homo erectus and archaic Homo sapiens.

Achilles \a -'ki-lez\ In Greek mythology, the bravest and strongest of the Greek warriors in the Trojan War. Because his mother dipped him into the River Styx, he was invulnerable except at the heel by which she held him. During the war against Troy Achilles took 12 nearby cities, but after a quarrel with Agamemnon he refused further service. He allowed his beloved cousin Patroclus to fight in his armor, and when Hector slew Patroclus, Achilles returned to battle, killed Hector, and dragged his body around the walls of Troy. Homer mentions Achilles' funeral but not the circumstances of his death; the later poet Arctinus relates that Paris killed Achilles with an arrow guided by Apollo.

Achilles Painter (fl. 5th century bc) Greek vase painter, named for an amphora decorated with a painting of Achilles and Briseis attributed to him. He was active in Athens in the time of Pericles and was a contemporary of Phidias. His Achilles vase (c. 450 bc) is among the finest surviving examples of red-figure pottery from the Classical period. He is also known for his lekythoi (funerary vases with coloured figures on a white background), which are regarded as the most reliable documentation of

monumental Greek paintings. Over 200 extant vase paintings are attributed to him.

Achinese \,a-ch9-'nez\ One of the main ethnic groups on the island of Sumatra, Indon. In the 13th century the Achinese became the first people in the archipelago to adopt Islam. After expelling the Portuguese in the 17th century, the sultanate of Acheh was dominant in northern Sumatra until it was conquered by the Dutch in 1904 (see Achinese War). Now part of the Indonesian republic, the Achinese are restive and are administered within a special district. They trace their descent through both maternal and paternal lines. Women have a high social position, and they do not wear veils. The group numbers roughly 2.1 million.

Achinese War (1873 -1904) Armed conflict between The Netherlands and the Muslim sultanate of Acheh in northern Sumatra. The Dutch considered the sultanate to be within their northern Sumatran sphere of influence and invaded it. Although the sultan capitulated, the Achinese people engaged the Dutch in a prolonged and costly guerrilla war, which the Dutch were able to win only by researching the area and devising a new “castle strategy” that relied on fortified bases.

acid Any substance that in water solution tastes sour, changes the colour of acid-base indicators (e.g., litmus), reacts with some metals (e.g., iron) to yield hydrogen gas, reacts with bases to form salts, and promotes certain chemical reactions (e.g., acid catalysis). Acids contain one or more hydrogen atoms that, in solution, dissociate as positively charged hydrogen ions. Inorganic, or mineral, acids include sulfuric acid, nitric acid, hydrochloric acid, and phosphoric acid. Organic acids include carboxylic acids, phenols, and sulfonic acids. Broader definitions of acids cover situations in which water is not present. See also acid-base theory.

acid and basic rocks Division of igneous rocks on the basis of their silicate mineral content, these minerals usually being the most abundant in such rocks. Rocks are described as acid, intermediate, basic, and ultrabasic, in order of decreasing silica content, because it was earlier thought that silica is present in rock magmas in the form of silicic acid. In mod-

em usage the terms do not refer to acidity in the chemical sense. In general, the gradation from acid to basic corresponds to an increase in colour (i.e., light to dark).

acid-base theory Any of several theories that give rise to alternative definitions of acids and bases. The original theory was based on Svante Arrhenius’s electrolytic theory of solutions and involved the dissociation of water into hydrogen and hydroxide ions. To explain the behaviour of a chemical, particularly if water is not present, two other theories were developed. The most widely accepted and useful is the Brpnsted-Lowry definition (1923): An acid is a chemical that tends to lose a proton (H +), and a base is a chemical that tends to gain a proton. Another is the Lewis definition (also 1923): An acid (see electrophile) is a chemical that can accept an electron pair from a base (see nucleophile), which they share to form a covalent bond. The three theories have superficial similarities but subtle and important differences for certain applications.

acid rain Any precipitation, including snow, that contains a heavy concentration of sulfuric and nitric acids. This form of pollution is a serious environmental problem in the large urban and industrial areas of North

America, Europe, and Asia. Automobiles, certain industrial operations, and electric power plants that burn fossil fuels emit the gases sulfur dioxide and nitrogen oxide into the atmosphere, where they combine with water vapour in clouds to form sulfuric and nitric acids. The highly acidic precipitation from these clouds may contaminate lakes and streams, damaging fish and other aquatic species; damage vegetation, including agricultural crops and trees; and corrode the outsides of buildings and other structures (historic monuments are especially vulnerable). Though usually most severe around large urban and industrial areas, acid precipitation may also occur at great distances from the source of the pollutants.

Ackermann, Konrad Ernst (baptized Feb. 4, 1712, Schwerin, Mecklenburg — d. Nov. 13, 1771, Hamburg) German actor-manager. After training with a theatre company that specialized in German adaptations of French plays, he led a troupe on tour throughout Europe in the 1750s. He became known for domestic drama and for playing roles that combined the comic and the sentimental. In 1765 he opened a theatre in Hamburg, considered the first German national theatre, and later turned its management over to his stepson, Friedrich L. Schroder (1744-1816), who brought Shakespeare to the German stage. See also actor-manager system.

ACLU See American Civil Liberties Union

acne \'ak-ne\ Inflammatory disease of the oil glands of the skin. Acne vulgaris, probably the most frequent chronic skin disorder, results from an interplay of hereditary factors, hormones, and bacteria, beginning in the teen years when overactive sebaceous glands are stimulated by high levels of androgens. Its primary lesion, the blackhead, may be open or closed; it consists of a plug of skin oil (sebum), cell debris, and microorganisms in a hair follicle. Acne has four grades of severity, with increasing degrees of spread, inflammation, pustule formation, and scarring. Methods of treatment vary from skin medication to antibiotics and hormones; many cases eventually resolve spontaneously.

Acoma Va-ko-moV Indian pueblo, west-central New Mexico, U.S. It is located on a reservation west of Albuquerque and is known as the “Sky City.” Its people live in terraced dwellings made of stone and adobe atop a sandstone butte 357 ft (109 m) high. Settled in the 10th century, it is believed to be the oldest continuously inhabited place in the U.S. In 1540 Spanish explorer Francisco Vazquez de Coronado described it as the strongest defensive position in the world.

Aconcagua X.a-kon-'ka-gwaV Mount Mountain, western Argentina, on the Chilean border. Located in the Andes Mountains at an elevation of 22,834 ft (6,960 m), it is widely considered the highest peak in the Western Hemisphere. It is of volcanic origin but is not itself an active volcano. The summit was first reached in 1897.

aconite Va-ko-.nlA Any member of two genera of perennial herbaceous plants of the buttercup family: Aconitum (monkshood or wolfsbane), consisting of summer-flowering poisonous plants, and Eranthis (winter aconite), consisting of spring-flowering ornamentals. The dried tuberous root of A. napellus was formerly used as a sedative and a painkiller.

acorn Nut of the oak. Acorns are usually seated in or surrounded by a woody cupule. They mature within one to two seasons, and their appearance varies depending on the species of oak. Acorns provide food for wildlife and are used to fatten swine and poultry.

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Acosta \a-'ko-sta\, Uriel orig. Gabriel da Costa (b. c. 1585, Oporto, Port. — d. April 1640, Amsterdam, Neth.) Portuguese Jewish freethinker. Born into a Marrano family, he came to feel that there was no salvation through the Roman Catholic church and converted to Judaism. His mother and brother also converted, and he and his family fled to Amsterdam. In 1616 he attacked rabbinic Judaism as nonbiblical and was excommunicated. When he enlarged on his criticisms in 1623-24, denying the immortality of the soul, he was arrested and fined. He recanted but was later excommunicated again. He recanted publicly in 1640, after which he wrote a short autobiography. Example of a Human Life, and shot himself.

acoustics \3-'ku-stiks\ Science of production, control, transmission, reception, and effects of sound. Its principal branches are architectural, environmental, musical, and engineering acoustics, and ultrasonics. Environmental acoustics focuses on controlling noise produced by aircraft engines, factories, construction machinery, and general traffic. Musical acoustics deals with the design and use of musical instruments and how musical sounds affect listeners. Engineering acoustics concerns sound recording and reproduction systems. Ultrasonics deals with ultrasonic waves, which have frequencies above the audible range, and their applications in industry and medicine.

acoustics, architectural Relationship between sound produced in a space and its listeners, of particular concern in the design of concert halls and auditoriums. Good acoustic design takes into account such issues as reverberation time; sound absorption of the finish materials; echoes; acoustic shadows; sound intimacy, texture, and blend; and external noise. Architectural modifications (e.g., orchestral shells, canopies, and undulating or angled ceilings and walls) may act as focusing elements to improve sound quality.

acquired immunodeficiency syndrome See AIDS
Acre See 'Akko

acrobatics Art of jumping, tumbling, and balancing. The art is of ancient origin; acrobats performed leaps, somersaults, and vaults at Egyptian and Greek events. Acrobatic feats were featured in the commedia dell' arte theatre in Europe and in jingxi (“Peking opera”) in China. The later use of apparatuses such as poles, tightropes, and flying trapezes made acrobatics a major attraction in circus performances. Its popularity increased in the 20th century with such performers as the Flying Wallendas (see Karl Wallenda).

acromegaly V.a-kro-'me-go-leN Growth and metabolic disorder in which the skeletal extremities enlarge when a pituitary gland tumor causes overproduction of growth hormone after maturity. It is often associated with

pituitary gigantism. Acromegaly is characterized by gradual enlargement of hands and feet, exaggeration of facial features, skin thickening, and enlargement of most internal organs, along with headaches, excessive sweating, and high blood pressure. Acromegalic individuals are likely to develop congestive heart failure, muscle weakness, joint pain, osteoporosis, and often diabetes mellitus and visual problems, including blindness. If treatment with surgery and/or radiation fails, then hormone therapy is used. Treatment can cause hormone deficiency, necessitating hormone replacement therapy; spontaneous events may also cause hormone deficiency.

acropolis (Greek: “city at the top”) Central, defensively oriented district in ancient Greek cities, located on the highest ground and containing the chief municipal and religious buildings. The renowned Athens Acropolis (5th century bc), atop a craggy walled hill, is home to four main edifices — the Propylaea (see propylaeum), Parthenon, Erechtheum (Ionic temple noted for its caryatid porch), and Temple of Athena Nike — all built from white marble plentiful in the region. See photograph opposite.

acrostic Originally, a short verse composition, constructed so that one or more sets of letters (such as the initial, middle, or final letters of the lines), taken consecutively, form words. An acrostic in which the initial letters form the alphabet is called an abecedarius. Ancient Greek and Latin writers, medieval monks, and Renaissance poets are among those who devised acrostics. Today the term is used for a type of word puzzle utilizing the acrostic principle. A popular form is double acrostics, puzzles constructed so that the middle or last, as well as initial, letters of lines may form words.

acrylic compound Any of a class of synthetic plastics, resins, and oils used to manufacture many products. By varying the starting reagents

(such as acrylic acid, C 3 H 4 0 2 , or acrylonitrile, C 3 H 3 N) and the process of forming, a material may be produced that is hard and transparent, soft and resilient, or a viscous liquid. Acrylic compounds are used to make molded structural and optical parts, jewelry, adhesives, coating compounds, and textile fibres. Lucite and Plexiglas are trademarks used for glasslike acrylic materials.

acrylic \3-'kri-lik\ painting Painting executed in the medium of acrylic resins — synthetic resins that dry rapidly, are water-soluble, and serve as a vehicle for any pigment. Its effects may range from the transparent brilliance of watercolour to the density of oil paint. Acrylics are less affected by heat and deterioration than oils. They were first used by artists in the 1940s but became popular with Pop artists when they were produced commercially in the 1960s.

Act of Union See Act of Union (1 707), Act of Union (1800)

Acta Latin "Acts" In ancient Rome, the daily minutes of public business and a record of political and social events. Julius Caesar in 59 bc ordered that the Senate’s daily doings {acta diurna, commentaria Senatus) be made public; Caesar Augustus later prohibited publication, though the Senate’s acts continued to be recorded and could be read with special permission. There were also public registers {acta diurna urbis, “daily minutes of the city”) of the acts of the popular assemblies and the courts as well as births, deaths, marriages, and divorces. These constituted a daily gazette, a prototype of the modern newspaper.

ACTH in full adrenocorticotropic \9- , dre-no- l kor-ti-ko- , tro-pik\ hormone Polypeptide hormone made in the pituitary gland. It regulates the activity of part of the adrenal cortex (see adrenal glands), the production site of important steroid hormones that affect electrolyte and water balance and the metabolism of fats, carbohydrates, and proteins. ACTH is found in vertebrates (except jawless fishes); in mammals it contains 39 amino acids. Overproduction of ACTH is one cause of Cushing syndrome.

actin One of two proteins responsible for contraction of muscle cells and the motility of other cells. It occurs as a monomer, G-actin, a globular protein, and in living cells as a polymer, F-actin, which resembles two strings of beads twisted around each other into thin filaments. The filaments occur in regular structures, alternated and interwoven with thick filaments that contain myosin, the other major muscle protein. The thick and thin filaments slide past each other, under the control of calcium ions, resulting in contraction (shortening) and relaxation (lengthening) of the muscle cells.

acting Art of representing a character on a stage or before a camera by means of movement, gesture, and intonation. Acting in the Western tradition originated in Greece in the 6th century bc; the tragedian Thespis is traditionally regarded as founder of the profession. Aristotle defined acting as “the right management of the voice to express various emotions” and declared it a natural gift that he doubted could be taught. Acting declined as an art in the Middle Ages, when Christian liturgical drama was performed by craft guilds and amateurs. Modem professional acting emerged in the 16th century with Italy’s commedia dell' arte troupes. It

The Acropolis, Athens.

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flourished during the era of William Shakespeare. Not until the 18th century, however, was acting considered a profession to be taken seriously, through the efforts in England of the actor-manager David Garrick and the talents of actors such as Sarah Siddons, Edmund Kean, and Henry Irving. Modern acting styles have been influenced by Konstantin Stanislavsky’s emphasis on the actor’s identification with his role and by Bertolt Brecht’s insistence on the objectivity and discipline of the actor. The Stanislavsky method was adopted in the U.S. by Lee Strasberg and Stella Adler (1901–92) and is the basis of most contemporary training, which features the cultivation of emotional and sense memory, physical and vocal training, and improvisation.

actinide \ l ak-t9-,nld\ Any of the series of 15 consecutive chemical ele-

ments in the periodic table from actinium to lawrencium (atomic numbers 89-103). All are radioactive heavy metals; and only the first four (actinium, thorium, protactinium, and uranium) occur in nature in appreciable quantities. The other 11 (the transuranium elements) are unstable and are produced only artificially. Actinides are transition elements, so their atoms have similar configurations and similar physical and chemical behaviour; the most usual valences are 3 and 4.

actinolite \ak-'ti-n 3 l- l It\ Colourless to green amphibole mineral, darkening with increased iron content from green to black. It has a prismatic and splintery texture and is abundant in regionally metamorphosed (see metamorphism) rocks such as schists. Actinolite has a monoclinic crystal structure, and it may alter to chlorite. See also asbestos.

actinomycete \,ak-ti-no-'mI-set\ Any of a group of generally low-oxygen-utilizing bacteria identified by a branching growth pattern that results in large threadlike structures. The filaments may break apart to form rods or spheroidal shapes. Some actinomycetes can form spores. Many species occur in soil and are harmless to animals and higher plants; others are important disease-causing agents. For diagnostic purposes in human infections, the presence of sulfur granules is used.

Action Francaise \ak-se-'o n -fra n - , sez\ (“French Action”) Influential right-wing antirepublican group in early 20th-century France, whose views were promoted in a newspaper of the same name. The Action Francaise movement, led by Charles Maurras, espoused the antiparliamentarian, anti-Semitic, and strongly nationalist views inspired by the Alfred Dreyfus Affair. The movement peaked after World War I, when nationalist feeling was strong. It was denounced by the papacy in 1926, and ceased to exist after World War II because of its association with the collaborationist Vichy government (see Vichy France).

action painting Direct, instinctual, dynamic style of painting that involves the spontaneous application of vigorous, sweeping brush strokes and the chance effects of dripping and spilling paint onto the canvas. The term characterizes the work of Jackson Pollock, Willem de Kooning, and Franz Kune. The “automatic” techniques developed in Europe by the Surrealists in the 1920s and ’30s had great influence on U.S. artists, who regarded a picture not merely as a finished product but as a record of the process of its creation. It was a major force in Abstract Expressionism in the 1950s. See also automatism, Tachism.

action potential Brief (about one-thousandth of a second) reversal of electric polarization of the membrane of a nerve or muscle cell. Stimulation of the cell by certain chemicals or by sensory receptor cells causes depolarization of the membrane, permitting an impulse to move along the nerve fibre (in nerve cells) or causing the cell to contract (in muscle cells).

Actium Vak-she-3m\, Battle of (31 bc) Naval battle off Acarnania, Greece, between Octavian (later Augustus) and Mark Antony. With 500 ships and 70,000 infantry, Antony camped at Actium, between the Ionian Sea and the Ambracian Gulf. Octavian, with 400 ships and 80,000 infantry, cut Antony’s line of communication from the north. Desertion by allies and a lack of supplies forced Antony to act. Outmaneuvered on land, he followed Cleopatra’s advice to attack Octavian at sea. Antony’s larger fleet included his own and Cleopatra’s ships. In the heat of battle Cleopatra fled with her galleys, and Antony followed with a few ships. His fleet surrendered immediately, his army a week later. Octavian’ s victory

left him undisputed ruler of the Roman world.

activation energy Minimum amount of energy (heat, electromagnetic radiation, or electrical energy) required to activate atoms or molecules to a condition in which it is equally likely that they will undergo chemical reaction or transport as it is that they will return to their original state. Chemists posit a transition state between the initial conditions and the

product conditions and theorize that the activation energy is the amount of energy required to boost the initial materials “uphill” to the transition state; the reaction then proceeds “downhill” to form the product materials. Catalysts (including enzymes) lower the activation energy by altering the transition state. Activation energies are determined by experiments that measure them as the constant of proportionality in the equation describing the dependence of reaction rate on temperature, proposed by Svante Arrhenius. See also entropy, heat of reaction.

active galactic nucleus Small region at the centre of a galaxy that emits a prodigious amount of energy in the form of radio, optical. X-ray, or gamma radiation or high-speed particle jets. Many classes of “active galaxies” have been identified; they appear similar in many respects to quasars. Astronomers suspect that the observed energy is generated as matter accretes onto a supermassive black hole with a mass millions or even billions of times that of the Sun. The accreting matter can outshine the rest of the galaxy as it is heated in very high-speed collisions outside the black hole’s event horizon. It is believed that many galaxies harbour these central black holes and that they might have been quasars in their early history, although they now appeal' to be dormant unless orbiting matter is accreting onto the black hole.

activity coefficient Number expressing the ratio of a substance’s chemical activity to its molar concentration (see mole). The measured concentration of a substance may not be an accurate indicator of its chemical effectiveness as represented by the equation for a particular reaction; in such cases, the activity is calculated by multiplying the concentration by the activity coefficient. In solutions, the activity coefficient is a measure of how much the solution differs from an ideal solution.

Acton (of Aldenham), John Emerich Edward Dahlberg Acton, 1st Baron (b. Jan. 10, 1834, Naples, Kingdom of Naples — d. June 19, 1902, Tegernsee, Bavaria, German Empire) English historian. He served in the House of Commons (1 859-65). Editor of the Roman Catholic monthly The Rambler (1 859-64), he resigned because of papal criticism of his scientific approach to history. An adviser to William E. Gladstone from 1865, he was raised to the peerage in 1869. In 1895 he was appointed Regius Professor of Modern History at the University of Cambridge. He later coordinated the massive publication project of The Cambridge Modern History. A critic of nationalism, he coined the familial' aphorism “Power tends to corrupt, and absolute power corrupts absolutely.”

actor-manager system Method of theatrical production prevalent in 19th-century England and the U.S. In this system, an actor formed a theatre company, chose the plays he wanted to produce, played the leading roles in them, and managed the company’s business arrangements. The first actor-managers emerged in the 17th century, and in the 18th century actor-managers such as Colley Cibber and David Garrick gained prominence. The system produced high performance standards, typified by

19th-century figures such as William Macready, Henry Irving, and Herbert Tree. It waned as actor-managers were replaced first by stage managers and later by directors.

Actors Studio Professional actors' workshop based in New York City. Founded in 1947 by the directors Cheryl Crawford, Eua Kazan, and Robert Lewis as a leading centre of the Stanislavsky method, it was directed by Lee Strasberg from 1948 to 1982. In 1962 it launched a company, and a workshop was established in Los Angeles in 1966. Actors work together without the pressures of commercial production. Membership is by invitation; six or seven new members are chosen yearly from 1,000 auditions. Members have included Marlon Brando, Marilyn Monroe, Paul Newman, and Robert De Niro.

actuary One who calculates insurance risks and premiums. Actuaries compute the probability of the occurrence of such events as birth, marriage, illness, accidents, and death. They also evaluate the hazards of property damage or loss and the legal liability for the safety and well-being of others. Usually employed by insurance companies, actuaries set premium rates based on statistical studies, establish underwriting procedures, and determine the amounts of money required to assure the payment of benefits.

Acuff Va-kof\, Roy (Claxton) (b. Sept. 15, 1903, Maynardsville, Tenn., U.S. — d. Nov. 23, 1992, Nashville, Tenn.) U.S. singer, songwriter, and fiddler. He turned to music after an aborted baseball career and gained immediate popularity with his recordings of "The Great Speckled Bird" and "The Wabash Cannonball." Reasserting the mournful musical tradi-

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tions of Southeastern rural whites, he became a national radio star on the "Grand Ole Opry" broadcasts. In 1942 he and songwriter Fred Rose founded Acuff-Rose Publishing, the first publishing house exclusively for country music. In 1962 Acuff was elected the first living member of the Country Music Hall of Fame.

acupressure or shiatsu \she-'at-sii\ Alternative-medicine practice in which pressure is applied to points on the body aligned along 12 main meridians (pathways), usually for a short time, to improve the flow of vital force (Qi). Though often referred to by its Japanese name, shiatsu, it originated in China thousands of years ago. A single point may be pressed to relieve a specific symptom or condition, or a series of points can be worked on to promote overall well-being. Some studies suggest that acupressure can be effective for certain health problems, including nausea, pain, and stroke-related weakness. Risks are minimal with cautious use. See also acupuncture.

acupuncture Medical technique in which needles are inserted into the skin and underlying tissues, devised in China before 2500 bc. One or more

small metal needles are inserted at precise points along 12 meridians (pathways) in the body, through which the vital life force (qi) is believed to flow, in order to restore yin-yang balance and treat disease caused by yin-yang imbalance. Acupuncture appears to relieve pain and is used as an anesthetic for surgery. Theories to explain its effects include stimulation of release of natural opiates, blockage of pain-signal transmission, and a placebo effect. See also acupressure.

Ada Va -do\ High-level computer programming language whose development was initiated in 1975 by the U.S. Dept, of Defense and standardized in 1983. Ada (named for the countess of Lovelace) was intended to be a common language for use on the department's computers, which were produced by many different manufacturers. It is similar to Pascal but contains many additional features convenient for the development of large-scale, multiplatform programs. The 1995 revision, called Ada 95, Supports OBJECT-ORIENTED PROGRAMMING.

Adad \a-'dad\ Babylonian and Assyrian god of weather, the son of Anu (sometimes called the son of Bel). He was known as the Lord of Abundance for rains that made the land bloom, but he sent death-dealing storms to his enemies. He was also the god of oracles and divination. Though widely worshiped, he was a minor god and appears to have had no cult center of his own.

Ada I Va-dsL Historical Islamic state, eastern Africa, southwest of the Gulf of Aden, with its capital at Harer (now in Ethiopia). Its rivalry with Christian Ethiopia began in the 14th century. In the early 16th century Adal launched a series of attacks. By 1533 Adal, now led by Ahmed Gran, succeeded in gaining control of most of central Ethiopia. Gran was killed in battle in 1543, and the Oromo invasions of the later 16th century ended Adal's power.

Adalbert Vad-^-.bortV, Saint orig. Vojtech (b. 956, Libice?, Bohemia — d. April 23, 997, near Gdansk, Pol.; feast day April 23) Czech prelate. Descended from the princes of Bohemia, he was trained in theology at Magdeburg. Elected the first native bishop of Prague in 982, he promoted the political aims of the Bohemian prince by extending the influence of the church beyond the Czech kingdom. Failing to convert his people, he retired in 988 to a monastery near Rome. On papal orders, he returned in 992 to find little change. Disillusioned, he left Bohemia in 994 to become a missionary along the Baltic coast, where he was martyred in 997. An account of his life was written by his friend and disciple St. Bruno of Querfurt. He was recognized as a saint soon after his death.

Adam, Robert (b. July 3, 1728, Kirkcaldy, Fife, Scot. — d. March 3, 1792, London, Eng.) Scottish architect and designer. Son of the architect William Adam, he apprenticed in his father's offices. He traveled in Europe in 1754-58, studying architectural theory and Roman ruins. On his return to London, he and his brother James (1732-94) developed an essentially decorative style — known as the Adam style — that was marked by a new lightness and freedom in the use of the Classical elements of architecture. This style is most remembered for its application in interiors, which were characterized by contrasting room shapes and delicate Classical ornaments. Robert Adam's executed works, mainly remodeled interiors and exteriors of private houses, include Osterley Park (1761-80) in Middlesex and Kedleston Hall (c. 1765-70) in Derbyshire. Other works include the Adelphi development in London (1768-72) and the University of Edinburgh (1789). He was also a leading furniture designer; his

style, popularized by designer George Hepplewhite, was meant to harmonize with his interior architecture down to the last detail.

Adam and Eve In the Judeo-Christian and Islamic traditions, the parents of the human race. Genesis gives two versions of their creation. In the first, God creates “male and female in his own image” on the sixth day. In the second, Adam is placed in the Garden of Eden, and Eve is later created from his rib to ease his loneliness. For succumbing to temptation and eating the fruit of the forbidden tree of knowledge of good and evil, God banished them from Eden, and they and their descendants were forced to live lives of hardship. Cain and Abel were their children. Christian theologians developed the doctrine of original sin based on the story of their transgression; in contrast, the Quran teaches that Adam’s sin was his alone and did not make all people sinners.

Adamawa \,a-da-'ma-wa\ Traditional emirate centered in what is now Adamawa state, eastern Nigeria. It was founded by Modibbo Adama in the early 19th century. He moved the capital several times before finally settling it in 1841 in Yola. The British Royal Niger Company established trading posts there; when the emir tried to force them out in 1901, they captured the town. Adamawa was partitioned in 1901 between British Northern Nigeria and German Kamerun (Cameroon). In 1919 the Cameroon portion was divided between the French and the British. The emirate’s territories eventually came to form almost all of northern Cameroon and part of eastern Nigeria.

Adamawa-Ubangi X.ad-o-'ma-wo-ii-'baq-geV languages formerly Adamawa-Eastern languages Branch of the huge Niger-Congo language family. Adamawa-Ubangi languages are spoken in eastern Nigeria, northern Cameroon, southwestern Chad, and western Central African Republic. The branch has two divisions, Adamawa in the west and Ubangi in the east. The Adamawa group comprises 80 languages, the least-studied languages in the Niger-Congo family. Nearly all have fewer than 100,000 speakers. The Ubangi group includes 40 languages and extends across a much broader region, from northern Cameroon across the Central Africa Republic to adjacent parts of southern Sudan and northern Congo (Kinshasa). Ubangi languages with more than a million speakers include those of the Banda, Gbaya, Ngbaka, and Zande peoples. Sango, a restructured form of one or more languages of the Ngbandi group of Ubangi, has become a lingua franca of the Central African Republic.

Adamov \9-'da-m9v\, Arthur (b. Aug. 23, 1908, Kislovodsk, Russia — d. March 16, 1970, Paris, France) Russian-born French playwright. He settled in Paris in 1924, and his first major work, written after suffering a nervous breakdown, was his autobiography, The Confession (1938-43). Influenced by August Strindberg and Franz Kafka, he began writing plays in 1947. Professor Taranne (1953) and Ping-Pong (1955) expressed a view of life’s meaninglessness that was characteristic of the Theatre of the Absurd. In Paolo Paoli (1957) and later plays, he abandoned Absurdism for radical political theatre influenced by Bertolt Brecht. He died from a drug overdose, an apparent suicide.

Adams, Abigail orig. Abigail Smith (b. Nov. 22, 1744, Weymouth, Mass. — d. Oct. 28, 1818, Quincy, Mass., U.S.) U.S. first lady. She was the daughter of a Congregational minister. Educated entirely at home, she became an avid reader of history. She married John Adams in 1764 and

raised four children, including John Quincy Adams, in Quincy, Mass. In 1774 she began a prolific correspondence with her husband, who was attending the Continental Congress in Philadelphia; she described daily life and discussed public affairs during the American Revolution with wit and political acuity. She continued her letters to family and friends while in Europe (1784-88) and Washington, D.C. (1789-1801), during her husband's diplomatic and presidential careers. She was considered an influential adviser to him.

Adams, Ansel (b. Feb. 20, 1902, San Francisco, Calif., U.S. — d. April 22, 1984, Carmel, Calif.) U.S. photographer. In 1927 he published Parmelian Prints of the High Sierras, photographs that imitated Impressionist painting by suppressing detail in favour of soft, misty effects achieved in the darkroom. Adams was known for his dramatic images of mountain landscapes. He became one of the outstanding technicians in the history of photography; Making a Photograph (1935) was the first of his many books on photographic technique. He worked consistently to foster public awareness of photography as a fine art. In 1940 he helped organize the first public collection of photographs, at the Museum of Modern Art, and in 1946 he established, at the California School of Fine Arts, the first academic photography department.

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Adams, Charles Francis (b. Aug. 18, 1807, Boston, Mass., U.S. — d. Nov. 21, 1886, Boston) U.S. diplomat. The son of John Quincy Adams and the grandson of John Adams, he served in the Massachusetts legislature and edited a Whig journal. He helped form the antislavery Free-Soil Party and in 1 848 was chosen its candidate for U.S. vice president. As ambassador to Britain (1861-68) he was instrumental in securing Britain's neutrality during the American Civil War and in promoting the arbitration of the Alabama claims.

Adams, Gerry orig. Gerard Adams (b. Oct. 6, 1948, Belfast,

N.Ire.) Irish nationalist and president of Sinn Fein, the political wing of the Irish Republican Army (IRA). He was interned without trial as a suspected terrorist in 1972, 1973-76, and 1978.

He became vice president of Sinn Fein in 1978 and persuaded the group to enter candidates in the 1981 elections. Elected to the British

House of Commons in 1983, he refused to take the oath of allegiance and never took his seat. In 1991, as Sinn Fein's president (from 1983), he began to shift its strategy toward negotiation; his efforts led to indirect talks with the British government and a 1993 agreement (the Downing Street Declaration) by the British and Irish prime ministers to consider the future of Northern Ireland. He was credited with the IRA's 1994 cease-fire announcement and was pivotal in winning support for the Good Friday Agreement (1998), which led to the creation of a power-sharing assembly in Northern Ireland.

Adams, Henry (Brooks) (b. Feb. 16, 1838, Boston, Mass., U.S. — d. March 27, 1918, Washington, D.C.) U.S. historian and man of letters. A product of Boston's elite Brahmin class and a descendant of two presidents, he was infused with disgust for American politics of his time. As a young newspaper correspondent and editor, he called for social and political reforms, but he later became disillusioned with a world he characterized as devoid of principle. That loss of faith was reflected in his novel Democracy (1880). His study of U.S. democracy culminated in his nine- volume History of the United States of America (1889-91), which received immediate acclaim. In Mont-Saint-Michel and Chartres (1913) he described the medieval worldview as reflected in its architecture. The Education of Henry Adams (1918), his best-known work and one of the outstanding autobiographies of Western literature, traced his confrontations with the uncertainties of the 20th century.

Adams, John (b. Oct. 30, 1735, Braintree, Mass. — d. July 4, 1826, Quincy, Mass., U.S.) U.S. politician, first vice president (1789-97) and second president (1797-1801) of the U.S. After graduating from Harvard College in 1755, he practiced law in Boston. In 1764 he married Abigail Smith (see Abigail Adams). Active in the American independence movement, he was elected to the Massachusetts legislature and served as a delegate to the Continental Congress (1774-78), where he was appointed to a committee with Thomas Jefferson and others to draft the Declaration of Independence. In 1776-78 he was appointed to many congressional committees, including one to create a navy and another to review foreign affairs. He served as a diplomat in France, the Netherlands, and England (1778-88). In the first U.S. presidential election, he received the second largest number of votes and became vice president under George Washington. Adams's term as president was marked by controversy over

his signing of the Alien and Sedition Acts in 1798 and by his alliance with the conservative Federalist Party. In 1800 he was defeated for reelection by Jefferson and retired to live a secluded life in Massachusetts. In 1812 he overcame his bitterness toward Jefferson, with whom he began an illuminating correspondence. Both men died on July 4, 1826, the Declaration's 50th anniversary. John Quincy Adams was his son.

Adams, John (Coolidge) (b. Feb. 15, 1947, Worcester, Mass., U.S.) U.S. composer. After studying at Harvard University he taught at the San Francisco Conservatory and conducted widely. His compositions, initially strongly influenced by minimalism, became tempered by expressive elements. His Nixon in China (1987) and The Death of Klinghoffer (1991) are two of the best-known operas of the late 20th century. Other celebrated works include Harmonium (1980), Grand Pianola Music (1982), and Harmonielehre (1984-85).

Adams, John Quincy (b. July 11, 1767, Braintree, Mass. — d. Feb. 23, 1848, Washington, D.C., U.S.) Sixth president of the U.S. (1825-29). He was the eldest son of John Adams, second president of the U.S., and Abigail Adams. He accompanied his father to Europe on diplomatic missions (1778-80) and was later appointed U.S. minister to the Netherlands (1794) and to Prussia (1797). In 1801 he returned to Massachusetts and served in the U.S. Senate (1803-08). Resuming his diplomatic service, he became U.S. minister to Russia (1809-11) and to Britain (1815-17). Appointed secretary of state (1817-24), he was instrumental in acquiring Florida from Spain and in drafting the Monroe Doctrine. He ran for the presidency in 1824 against three other candidates; none received a majority of the electoral votes, though Andrew Jackson received a plurality. By constitutional design, the selection of the president went to the House of Representatives, where Adams was elected after receiving crucial support from Henry Clay, who had finished third in the initial balloting. He appointed Clay secretary of state, which further angered Jackson. Adams's presidency was unsuccessful; when he ran for reelection, Jackson defeated him. In 1 830 he was elected to the House, where he served until his death. He was outspoken in his opposition to slavery; in 1839 he proposed a constitutional amendment forbidding slavery in any new state admitted to the Union. Southern congressmen prevented discussion of antislavery petitions by passing gag rules (repealed in 1844 as a result of Adams's persistence). In 1841 he successfully defended the slaves in the Amistad mutiny case.

Adams, Samuel (b. Sept. 27, 1722, Boston, Mass. — d. Oct. 2, 1803, Boston, Mass., U.S.) American Revolutionary leader. A cousin of John Adams, he graduated from Harvard College in 1740 and briefly practiced law. He became a strong opponent of British taxation measures and organized resistance to the Stamp Act. He was a member of the state legislature (1765-74), and in 1772 he helped found the Committees of Correspondence. He influenced reaction to the Tea Act of 1773, organized the Boston Tea Party, and led opposition to the Intolerable Acts. A delegate to the Continental Congress (1774-81), he continued to call for separation from Britain and signed the Declaration of Independence. He helped draft the Massachusetts constitution in 1780 and served as the state's governor (1794-97).

Adams, Walter S(ydney) (b. Dec. 20, 1876, Syria — d. May 11, 1956, Pasadena, Calif., U.S.) Syrian-born U.S. astronomer. He returned to the U.S. with his missionary parents when he was eight and studied at Dartmouth College, the University of Chicago, and the University of Munich. Using spectroscopy, he investigated sunspots and the rotation of the Sun, the velocities and distances of thousands of stars, and planetary atmospheres. In 1904 he joined the original staff of Mount Wilson Observatory, where he served as director (1923-46). He took an important part in planning the 200-in. (5-m) telescope for the Palomar Observatory.

Adam's Peak Mountain, south-central Sri Lanka. Standing 7,360 ft (2,243 m) high, it is sacred and a place of pilgrimage to Buddhists, Muslims, and Hindus. On its summit, it has a large hollow, 5 ft (1.5 m) long, that is venerated as the footprint of Buddha, Adam, and Shiva, respectively. Many pilgrims of all faiths visit the peak every year.

Adamson, Joy orig. Joy-Friederike Victoria Gessner (b. Jan. 20, 1910, Troppau, Silesia, Austria-Hungary — d. Jan. 3, 1980, Shaba National Reserve, Kenya) Czech-born British naturalist. Educated in Vienna, she moved to Kenya in 1939. She became known worldwide for books describing how she and her husband, George, raised a lion cub, Elsa, and returned it to its natural habitat: Born Free (1960), Living Free (1961), and Forever Free (1962). The books were adapted into two films.

Charles Francis Adams

LIBRARY OF CONGRESS, WASHINGTON, D.C.

John Adams, oil painting by Gilbert Stuart, 1826; in the National Collection of Fine Arts, Washington, D.C.

COURTESY OF THE NATIONAL COLLECTION OF FINE ARTS, SMITHSONIAN INSTITUTION, WASHINGTON D.C.

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She later repeated her rehabilitation success with cheetah and leopard cubs. In addition to writing other books, she founded the Elsa Wild Animal Appeal (1961), an international conservation fund. She was killed by a disgruntled employee.

Adamson, Robert See Hill, David Octavius, and Robert Adamson

Adana \,a-da-'na\ City (pop., 1997: 1,041,509), south-central Turkey, on the Seyhan River. An agricultural and industrial centre and one of Turkey’ s largest cities, it probably overlies a H ittite settlement that dates from c. 1400 bc. Conquered by Alexander the Great in 335-334 bc, it was later a Roman military station. It came under the rule of the 'Abbasid dynasty at the end of the 7th century ad and changed hands intermittently until the late 14th century, when it fell into the hands of the Ramazan dynasty, a Turkmen group that remained influential even after the city’s conquest by the Ottoman Empire in 15 16. Adana’s prosperity has long derived from the fertile valleys behind it and its position as a bridgehead on the trade routes connecting Anatolia and the Arabian Peninsula.

Adanson \a-da n -so n \, Michel (b. April 7, 1727, Aix-en-Provence, France — d. Aug. 3, 1806, Paris) French botanist. He studied theology, classics, and philosophy in Paris before traveling to Senegal, where he lived several years. He returned with a large collection of plant specimens, now in the National Museum of Natural History. In Families of Plants (1763), he described his classification system; it was opposed by Carolus Linnaeus, whose system eventually prevailed. He was the first to classify mollusks. He also studied electricity in torpedo fish and the effects of electrical current on regenerating frog legs and heads. He is now known mainly for introducing the use of statistical methods in botanical studies.

Adapa \3-'da-p3\ Legendary sage of the Sumerian city of Eridu. Endowed with great intelligence by Ea but still mortal, he was the hero of the Sumerian myth of the Fall of Man. Adapa was fishing when he was blown into the sea by the southern wind, whose wings he broke in rage. The heavenly doorkeepers Tammuz and Ningishzida interceded for him when he was summoned before Anu for punishment, but when Anu offered him the bread and water of eternal life, he refused, and humankind thus became mortal.

adaptation In biology, the process by which an animal or plant becomes fitted to its environment. It is the result of natural selection acting on inherited variation. Even simple organisms must be adapted in many ways, including structure, physiology, and genetics; movement or dispersal; means of defense and attack; and reproduction and development. To be useful, adaptations must often occur simultaneously in different parts of the body.

ADD See attention deficit disorder

Adda River \'ad-da\ River, Lombardy region, Italy. It flows southward 194 mi (313 km) through Lake Como and across the Lombardy Plain before joining the Po River above Cremona. It is used extensively for hydroelectric power in its upper course and for irrigation on the plain. Historically, it has served as a strategic defense line in wars dating back to the Roman period.

Addams, Charles (Samuel) (b. Jan. 7, 1912, Westfield, N.J., U.S. — d. Sept. 29, 1988, New York, N.Y.) U.S. cartoonist. He worked briefly as a commercial artist before selling his first cartoon to The New Yorker in 1933. He became famous for darkly humorous cartoons depicting morbid behaviour by sinister-looking characters, especially a family of ghouls whose activities travestied those of a conventional family; in one popular image, they prepare to pour boiling oil on a group of Christmas carolers. These evolved into The Addams Family , a 1960s television series that generated two Hollywood films.

Addams, Jane (b. Sept. 6, 1860, Cedarville, 111., U.S. — d. May 21, 1935, Chicago, 111.) U.S. social reformer. Addams graduated from Rockford Female Seminary in Illinois in 1881 and was granted a degree the following year when the institution became Rockford College. During a trip to Europe in 1887-88 she visited the Toynbee Hall settlement house in London, which sparked her interest in social reform. Determined to create something like Toynbee Hall in the U.S., in 1889 she cofounded Hull House in Chicago, one of the first settlement houses in North America to provide practical services and educational opportunities for the poor. She subsequently championed social reforms such as juvenile-

court law, justice for immigrants and African Americans, worker's rights and compensation, and women's suffrage. In 1910 she became the first

female president of the National Conference of Social Work. An ardent pacifist, she served in 1915 as chair of the International Congress of Women and helped form the Women's International League for Peace and Freedom and the American Civil Liberties Union. In 1931 she shared the Nobel Prize for Peace with Nicholas M. Butler.

adder Any of several venomous snakes of the viper family (Viperidae) and the death adder, a viperlike elapid. Vipers include the common adder, puff adders, and night adders.

Adders occur in Europe, Asia,

Africa, and Australia. They range in length from 18 in. to 5 ft (45 cm to 1.5 m). The puff adder of Africa and the death adder of Australia and the nearby islands are particularly venomous, with a bite potentially lethal to humans. The name is also used for other snakes (e.g., the hognose SNAKE).

Adderley, Cannonball orig. Julian Edwin Adderley (b. Sept. 15, 1928, Tampa, Fla., U.S. — d. Aug. 8, 1975, Gary, Ind.) U.S. jazz saxophonist. He worked as a music teacher and led army bands before moving to New York City in the mid-1950s. Acclaimed as a stylistic heir of Charlie Parker, he was also influenced by the more traditional rhythm-and-blues phrasing of Benny Carter. He performed with trumpeter Miles Davis from 1957 to 1959, then led an ensemble with his brother, cornetist Nat Adderley (1931-2000). In the 1960s he introduced gospel-music harmonies to his music.

Addis Ababa Vad-dis-'a-ba-.ba, 'a-das-'a-bs-boX Capital and largest city (pop., 1994: 2,112,737) of Ethiopia. It lies on a plateau in the country's geographic centre at an altitude of about 8,000 ft (2,450 m). The city was founded as the capital in 1887 because of the unsatisfactory location of the former capital, Entoto. Addis Ababa was the capital of Italian East Africa 1935-41. It has become the national centre for higher education, banking and insurance, and trade. Several international organizations have their headquarters there, including the Organization of African Unity. In recent decades it has suffered unrest and extensive damage as a result of the country's political instability.

Addison, Joseph (b. May 1, 1672, Milston, Wiltshire, Eng. — d. June 17, 1719, London) English essayist, poet, and dramatist. His poem on the Battle of Blenheim, The Campaign (1705), brought him to the attention of leading Whigs and paved the way to important government posts (including secretary of state) and literary fame. With Richard Steele, he was a leading contributor to and

guiding spirit of the periodicals The Tatler (1709-11) and The Spectator (1711-12, 1714). One of the most admired masters of English prose, he brought to perfection the periodical essay. His Cato (1713), a highly successful play with political overtones, is one of the important tragedies of the 18th century.

Addison disease Disease in which gradual atrophy of the adrenal cortex causes the adrenal glands to produce insufficient quantities of the steroid hydrocortisone while causing the pituitary gland to produce excess quantities of pituitary hormones. Most of the cortex tissue is destroyed by the time symptoms (including weakness, abnormal coloration, weight loss, and hypotension) appear. Hydrocortisone-replacement therapy is often successful, usually given with other hormones to stabilize sodium levels. More than half of cases are believed to be due to an autoimmune reaction (see autoimmune disease); the remainder are caused by destruction of the adrenal gland by granuloma (e.g., tuberculosis).

additive In foods, any of various chemical substances added to produce desirable effects. Additives include such substances as artificial or natural colourings and flavourings; stabilizers, emulsifiers, and thickeners;

Puff adder (Bitis arietans)

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Joseph Addison, oil painting by Michael Dahl, 1 71 9; in the National Portrait Gallery, London.

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preservatives and humectants (moisture-retainers); and supplementary nutrients. Though many additives are harmless or even beneficial, others reduce nutritional value or conceal inferior raw materials or processing.

Adelaide City (pop., 2004 est.: 1,124,315) and capital, South Australia. Adelaide lies at the base of the Mount Lofty Ranges on the Torrens River, near its harbour facilities at Port Adelaide. Founded in 1 836, it was

incorporated in 1840 as Australia’s first municipal government. Its rise as an agricultural marketing centre and the proximity of natural mineral deposits contributed to its economic growth. It is an industrial centre and has petroleum refineries as well as connections by pipeline to natural gas fields. Landmarks include the University of Adelaide, Parliament House, Government House, and two cathedrals.

Aden Ya-dsn, 'a-don\ Seaport city (pop., 2004 prelim.: 580,000), southern Yemen, on the Gulf of Aden. It was a principal terminus of the spice road of western Arabia for about 1,000 years before the 3rd century ad. It then became a trading centre under Yemeni, Ethiopian, and Arab control. The Ottoman Empire captured the city in 1538, and the British (who established a garrison there around 1800) governed it from India (1 839—1937). It grew in importance as a coaling station and transshipment point after the opening of the Suez Canal. It was made a crown colony in 1937, incorporated in the Federation of South Arabia (1963-67), and served as the capital of South Yemen until that republic’s merger with North Yemen in 1990.

Aden, Gulf of Arm of the Indian Ocean between the Arabian Peninsula and Somalia. To the west, it narrows into the Gulf of Tadjoura; its eastern limit is the meridian of Cape Guardafui. In these terms it is about 550 mi (885 km) long; geologically, it extends a total of 920 mi (1,480 km), to the eastern limits of the continental shelf beyond the Khuriyya Muriyya islands to the north and the island of Socotra to the south. Its marine life is rich in quantity and variety. Its coastline lacks large-scale fishing facilities but supports many fishing towns, as well as the major ports Aden and Djibouti.

Adena \3-'de-no\ culture Culture of various communities of ancient North American Indians who occupied the middle Ohio River valley c. 500 bc-ad 100. The Adena usually lived in villages containing circular houses constructed of poles and bark. They subsisted by hunting, fishing, and gathering wild plant foods, and they used a variety of stone tools and simple pottery. Adena ornaments of copper, mica, and seashells indicate trade with faraway peoples. See also Woodland culture.

Adenauer \'a-d 3 n-aur\, Konrad (b. Jan. 15, 1876, Cologne, German Empire — d. April 19, 1967, Rhondorf, W.Ger.) German statesman, first chancellor of the Federal Republic of Germany (West Germany). Elected to the Cologne city council (1906), he served as the city’s lord mayor (1917-33). He was elected to the Prussian Staatsrat (state council) in 1920 and served as its speaker (1928-33). He lost his posts when the Nazis came to power, and in 1944 he was sent to a concentration camp. As World War II drew to a close, he played an important role in the formation of the Christian Democratic Union. As chancellor from 1949, Adenauer stressed individualism under the rule of law. His fear of Soviet expansion made him a strong supporter of NATO. He

worked hard to reconcile Germany with its former enemies, especially France. He retired his post in 1963.

adenine Va-d 3 n-,en\ Organic compound of the purine family, often called a base, consisting of two rings, each containing both nitrogen and carbon atoms, and an amino group. It occurs free in tea and in combined form in nucleic acids, ATP, vitamin B 12 , and several coenzymes. In DNA its complementary base is thymine. It or its corresponding nucleoside or nucleotide may be prepared from nucleic acids by selective techniques of HYDROLYSIS.

adenoids \'a-d 3 n-,6idz\ or pharyngeal tonsils N.far-on-'je-ol, fo-'rin-je-olX Mass of lymphoid tissue, similar to the (palatine) tonsils, on the back wall of the nasal pharynx. If the adenoids become infected in childhood, their inflammation can obstruct nasal breathing and sinus drainage (promoting sinusitis) and block the eustachian tubes that connect to the middle ear (setting the stage for otitis). Surgical removal of enlarged or infected adenoids is frequently recommended.

adenosine triphosphate See ATP

adenovirus \,a-d 3 n-o-'vI-r9s\ Any of a group of spheroidal viruses, made up of DNA wrapped in a protein coat, that cause sore throat and fever in humans, hepatitis in dogs, and several diseases in fowl, mice, cattle, pigs, and monkeys. An adenovirus develops within the nucleus of an infected cell. In humans, adenoviruses, like cold viruses, may cause infections of the upper respiratory tract, the eyes, and frequently the lymph nodes. Like cold viruses, adenoviruses are often found in inactive infections in clinically healthy persons. Because only a few adenoviruses commonly cause illness in humans, vaccines against them are possible.

Ades \'ad-9s\, Thomas (b. March 1, 1971, London, Eng.) British composer. Trained as a pianist at the Guildhall School, he later attended King’s College, Cambridge. Initial recognition came for his virtuoso piano playing, but he started to write music in 1990 (Five Eliot Landscapes) and was instantly acclaimed as a major composer for his inventiveness and remarkably assured technique. His controversial opera Powder Her Face (1995), about a 20th-century divorce scandal, attracted international attention, as did his large symphonic work Asyla (1997).

ADHD See ATTENTION DEFICIT DISORDER

Adi Granth \,a-de-'granth\ (Punjabi: “First Book”) Sacred scripture of Sikhism. Composed of nearly 6,000 hymns of the Sikh Gurus and Hindu and Islamic saints, it is the central object of worship in all gurdwaras (temples). It is ritually opened and closed daily and is read continuously on special occasions. First compiled in 1604 by Arjan, it included his own hymns and those of his predecessors and the devotional songs of saints. In 1704 the last Guru, Gobind Singh, added more hymns and decreed that after his death the Granth would take the place of the Guru. Written mostly in Punjabi or Hindi, it contains the Mul Mantra (basic prayer), Japji (the most important scripture, written by Nanak), and hymns arranged according to the ragas in which they are to be sung.

Adige Va-de-ja\ River River, 255 mi (410 km) long, the longest in Italy after the Po. It rises below the Resia Pass and flows southeast through the

Venosta valley. After receiving the Isarco River at Bolzano, it turns south across the Po lowlands to enter the Adriatic Sea south of Chioggia. It supplies hydroelectric power in its upper Alpine section and irrigation for the Veneto. Its floods, notably those of 1951 and 1966, do great damage and require constant control of the riverbank. The Adige has been the scene of many battles, especially in the Austrian-Italian campaign of 1916.

adipose tissue or fatty tissue Connective tissue consisting mainly of fat cells, specialized to synthesize and contain large globules of fat, within a structural network of fibres. It is found mainly under the skin but also in deposits between the muscles, in the intestines and in their membrane folds, around the heart, and elsewhere. The fat stored in this tissue comes from dietary fats or is produced in the body. It acts as a fuel reserve for times of starvation or great exertion, helps conserve body heat, and forms pads between organs.

Adirondack V.a-ds-'ran-.dakX Mountains Mountains in northeastern New York state, U.S. They extend south from the St. Lawrence River valley and Lake Champlain to the Mohawk River valley. The Adirondack region covers more than 6 million acres (2.4 million hectares). It has more than 40 summits higher than 4,000 ft (1,219 m); the tallest, Mount Marcy (5,344 ft [1,629 mj), is the state’s highest. Samuel de Champ ain became the first European to sight the Adirondacks in 1609. The area was sparsely settled when in 1 892 the state legislature created Adirondack Park, which has grown over the years to become, at more than 5 million acres (2 million hectares), the largest U.S. state or national park outside of Alaska.

Adler, Alfred (b. Feb. 7, 1870, Penzing, Austria — d. May 28, 1937, Aberdeen, Aberdeenshire, Scot.) Austrian psychiatrist. He earned his medical degree in Vienna, and from his earliest years as a physician he stressed consideration of the individual in relation to his total environment. A student and associate of Sigmund Freud (1902-11), he eventually broke with Freud over the importance of early-childhood sexual conflicts

Konrad Adenauer.

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in the development of psychopathology. With his followers he developed the school of individual psychology — the humanistic study of drives, feelings, emotions, and memory in the context of the individual’s overall life plan. Adler advanced the theory of the inferiority complex to explain cases of psychopathology; Adlerian psychotherapy sought to direct patients emotionally disabled by inferiority feelings toward maturity, common sense, and social usefulness. He established the first child guidance clinic

in 1921 in Vienna. He taught in the U.S. (at Columbia University and the Long Island College of Medicine) from 1927 until his death. His works include Understanding Human Nature (1927) and What Life Should Mean to You (1931).

Adler, Guido (b. Nov. 1, 1855, Eibenschiitz, Moravia, Austrian Empire — d. Feb. 15, 1941, Vienna, Austria) Austrian musicologist. After studying music theory and composition at the Vienna Conservatory, he studied music history at the University of Vienna under Eduard Hanslick (1825-1904), whom he succeeded as professor. He worked with Philipp Spitta (1841-94) and Friedrich Chrysander in founding musicology as an academic discipline. Among his distinguished students were Karl Geiringer (1899-1989), Knud Jeppesen (1892-1974), Anton Webern, and Egon Wellesz (1885-1974).

Adler, Larry orig. Lawrence Cecil Adler (b. Feb. 10, 1914, Baltimore, Md., U.S. — d. Aug. 7, 2001, London, Eng.) U.S. harmonica player. Though he was initially unable to read music, he learned classical compositions by ear and became the first person to perform concert music on the harmonica. His musicality attracted many composers to write especially for him, including Darius Milhaud and Ralph Vaughan Williams. Accused of communist sympathies and blacklisted in the early 1950s, he was unable to find work in the U.S. and took up residence in England.

Adler, Mortimer J(erome) (b. Dec. 28, 1902, New York, N.Y., U.S. — d. June 28, 2001, San Mateo, Calif.) U.S. philosopher, educator, and editor. He earned a doctorate in philosophy from Columbia University (1928) and taught philosophy of law from 1930 at the University of Chicago, where with Robert M. Hutchins he promoted the idea of liberal education through regular discussions of the great books. Together they edited the 54-volume Great Books of the Western World (1952); for Ency-CLOPAlDIA Britannica, Inc., they edited an annual, The Great Ideas Today (from 1961), and the 10- volume Gateway to the Great Books (1963). In 1969 Adler became director of planning for the 15th edition of Encyclopedia Britannica, published in 1974. His many books include How to Read a Book (1940), How to Think About God (1980), Six Great Ideas (1981), and Ten Philosophical Mistakes (1985).

administrative law Law regulating the powers, procedures, and acts of public administration. It applies to all public officials and public agencies. As distinguished from legislative and judicial authority, administrative authority entails the power to issue rules and regulations based on statutes, grant licenses and permits to facilitate the conduct of government business, initiate investigations of and provide remedies for complaints or problems, and issue orders directing parties to conform to governing statutes or rules. An administrative-law judge is a government official with quasi-judicial powers, including the authority to conduct hearings, make findings of fact, and recommend resolution of disputes concerning the agency’s actions.

admiral butterfly Any of several species of butterflies (family Nymphalidae) that are colourful, fast-flying, and much prized by collectors. The migratory red admiral (Vanessa atalanta), widespread in Europe, Scandinavia, North America, and North Africa, feeds on stinging nettles. The Indian red admiral (V indica) is found in the Canary Islands and India. The white admiral (Limenitis Camilla, or Basilarchia arthemis), a Eurasian and North American species, feeds on honeysuckle.

Admiralty, High Court of See High Court of Admiralty

Admiralty Islands Island group (pop., 2000 est.: 41,748), Papua New Guinea. An extension of the Bismarck Archipelago comprising about 40 islands, the Admiralty Islands lie about 190 mi (300 km) north of the mainland of Papua New Guinea in the South Pacific Ocean. Most of the land area of the islands is contained in Manus Island, which is the site of Lorengau, the islands' principal settlement. First sighted by the Dutch explorer Willem Schouten in 1616, it was named by the British captain Philip Carteret in 1767. Subsequently ruled by the Germans, Australians, and Japanese, the islands were made part of the UN Trust Territory of

New Guinea in 1946. When Papua New Guinea attained independence in 1975, the islands became part of that country.

admiralty law See maritime law

adobe \3-'do-be\ Handmade sun-dried bricks formed from a mixture of heavy clay and straw found in arid regions. As a building material, adobe dates back thousands of years and is found in many parts of the world. Molds for shaping the bricks were brought to the New World by the Spanish. Excellent insulating properties make adobe an ideal material for both dwellings and ovens; home interiors retain heat in winter and stay cool in summer. The adobe buildings at Taos, N.M., are typical of Native American pueblo dwellings.

adolescence Period of life from puberty to adulthood (roughly ages 12-20) characterized by marked physiological changes, development of sexual feelings, efforts toward the construction of identity, and a progression from concrete to abstract thought. Adolescence is sometimes viewed as a transitional state, during which youths begin to separate themselves from their parents but still lack a clearly defined role in society. It is generally regarded as an emotionally intense and often stressful period.

Adonis \3-'da-nos\ In Greek mythology, a youth of remarkable beauty, the favorite of Aphrodite. As a child he was put in the care of Persephone, who refused to allow him to return from the underworld. Zeus ruled that he should spend a third of the year with Persephone, a third with Aphrodite, and a third on his own. He became a hunter and was killed by a boar. In answer to Aphrodite's pleas, Zeus allowed him to spend half the year with her and half in the underworld. Mythically, Adonis represents the cycle of death and resurrection in winter and spring. He is identified with the Babylonian god Tammuz.

adoption Act of transferring parental rights and duties to someone other than the adopted person's biological parents. The practice is ancient and occurs in all cultures. Traditionally, its goal was to continue the male line for the purposes of inheritance and succession; most adoptees were male (and sometimes adult). Contemporary laws and practices aim to promote child welfare and the development of families. In the latter part of the 20th century, there was a relaxation of traditional restrictions on age differences between adoptive parents and children, on the parents' minimum income level, on the mother's employment outside the home, and on placements across religious and ethnic lines. Single-parent adoptions and adoptions by same-sex couples also became more acceptable. Beginning in the 1970s, a growing adoptees-rights movement in the United States called for the repeal of confidentiality laws in most states that prevented

adoptees as adults from viewing their adoption records, including their original birth certificates.

Adorno Xa-'dor-noV Theodor (Wiesengrund) (b. Sept. 11, 1903, Frankfurt am Main, Ger. — d. Aug. 6, 1969, Visp, Switz.) German philosopher. He immigrated to England in 1934 to escape Nazism. He lived for 10 years in the U.S. (1938-48) before returning to Frankfurt, where he taught and headed the Frankfurt Institute for Social Research (see Frankfurt School). He is notable for his books and essays on philosophy, literature, psychology, sociology, and music (which he studied with Alban Berg). For Adorno, the great task of modernist music, literature, and art was to keep alive the possible social alternatives to capitalism, which philosophy and political theory could no longer imagine. His works include Dialectic of Enlightenment (1947; with Max Horkheimer), Minima Moralia (1951), and Notes to Literature (4 vols., 1958-74).

Adour \3-'dur\ River River, southwestern France. Flowing northwest from the Pyrenees, it traverses the scenic Campan valley; beyond Tarbes it feeds irrigation canals, most importantly the Canal d'Alaric. After a course of 208 mi (335 km), it empties into the Bay of Biscay below Bayonne.

adrenal \o-'dre-n 3 l\ gland or suprarenal \ I su-pr9-'re-n 3 l\ gland Either of two small, triangular endocrine glands over the kidneys. In humans, each gland weighs about 0.15 oz (4.5 g) and consists of an inner medulla, which produces the catecholamine hormones epinephrine and norepinephrine, and an outer cortex (about 90% of the gland), which secretes the steroid hormones aldosterone, cortisol, and androgens (the last two in response to ACTH from the pituitary gland). Diseases of the adrenal glands include pheochromocytoma (a tumour of the medulla) and the cortical disorders Addison disease, adrenal hypertrophy, Cushing syndrome, and primary aldosteronism.

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adrenaline See epinephrine

Adrian \'a-dre-3n\ IV orig. Nicholas Breakspear (b. 1100?, Abbot's Langley, near St. Albans, Hertfordshire, Eng. — d. Sept. 1, 1159, Anagni, near Rome [Italy]) Pope (1154-59), the only Englishman ever to hold the office. He served in France and Italy before a successful mission to Scandinavia led to his election as pope. Adrian crowned Frederick I Barbarossa emperor in 1155, after Frederick had turned over Arnold of Brescia, leader of a revolt in Rome. The relationship quickly soured, however, as a result of Adrian's policy toward the Normans of southern Italy and his assertion that Frederick had received the imperial crown as a benefice. His controversial bull Laudabiliter supposedly gave Ireland to Henry II of England, a claim that was later refuted. Adrian's refusal to recognize the king of Sicily, William I, stirred revolt in the Campania.

Adrian, Edgar Douglas later 1st Baron Adrian of Cambridge

(b. Nov. 30, 1889, London, Eng. — d. Aug. 4, 1977, London) British electrophysiologist. He amplified electrical potential variations in nerve impulses from sense organs to record ever smaller changes, eventually recording impulses from single sensory endings and motor nerve fibres. His work clarified the physical basis of sensation and the mechanism of muscular control. Adrian's later studies of brain electrical activity included investigations into epilepsy and the location of cerebral lesions. He shared a 1932 Nobel Prize with Charles Sherrington.

Adrianople, Battle of or Battle of Hadrianopolis (ad 378)
Battle fought in what is now Edirne, Tur., that marked the beginning of serious Germanic incursions into Roman territory. It pitted the Roman army under the emperor Valens against the horsemen of the Visigoths, Ostrogoths, and other Germanic tribes. The Roman army was annihilated and Valens died on the battlefield. His successor, Theodosius I, and the Goths agreed in 382 that the Goths would help with imperial defenses in exchange for food subsidies. The treaty set the pattern for later barbarian intrusions.

Adrianople, Treaty of see Treaty of Edirne

Adriatic Sea Arm of the Mediterranean Sea, lying between Italy and the Balkan Peninsula. It is about 500 mi (800 km) long, with an average width of 110 mi (175 km), a maximum depth of 4,035 ft (1,324 m), and an area of 50,590 sq mi (131,050 sq km). The Italian coast is relatively straight and continuous, having no islands, but the Balkan coast is full of islands, generally running parallel to the shore. The Strait of Otranto at its southeasterly limit links it with the Ionian Sea.

adsorption Capability of a solid substance (adsorbent) to attract to its surface molecules of a gas or solution (adsorbate) with which it is in contact. Physical adsorption depends on van der Waals forces of attraction between molecules and resembles condensation of liquids. In chemical adsorption (often called chemisorption; see catalysis), the gas is held to the surface by chemical forces specific to the chemicals involved, and formation of the bond may require an activation energy.

'Adullam Vo-'dol-omX Ancient village, Israel, about 15 mi (24 km) southwest of Jerusalem. A cave in its vicinity was from early times a place of refuge; it is mentioned several times in the Bible (e.g., as the place where David hid from Saul).

adult education See continuing education

adultery Sexual relations between a married person and someone other than his or her spouse. Prohibitions against adultery are found in virtually every society; Jewish, Christian, and Islamic traditions all condemn it, and in some Islamic countries it is still punishable by death. Attitudes toward adultery in different cultures have varied widely. Under the Code of Hammurabi (18th century bc) in Babylonia it was punishable by death by drowning, and in ancient Rome an offending woman could be killed, though men were not severely punished. In western Europe and North America, adultery by either spouse is a ground for divorce, though in the U.S. the shift to no-fault divorce significantly reduced the importance of adultery as an element in divorce proceedings. The spread of Western ideas of equality in marriage has resulted in pressure for equal marital rights for women in traditional African and Southeast Asian societies.

adulthood Period in the human life span in which full physical and intellectual maturity have been attained. Adulthood is commonly thought of as beginning at age 20 or 21. It includes middle age (commencing around age 40) and old age (from about age 60). Physically, it is characterized by the peaking (around age 30) and gradual decline of bodily

functioning; the postpeak phase includes diminished acuity of the senses, reduction in muscular and skeletal mass, buildup of cholesterol in the arteries, weakening of the heart muscle, and diminished production of hormones. Some slowing in the rate of central-nervous-system processing also begins with middle age, but it is generally compensated for by an increased capacity to retain practical information and apply accumulated cultural knowledge. In old age, most individuals experience a significant decline in physical capacity, and many eventually also suffer impaired mental function.

Advaita \3d-'vl-t3\ (Sanskrit: “Nondualism”) Most influential school of Vedanta. It originated with Gaudapada’s 7th-century commentary on the Mandukya Upanishad. Gaudapada builds on the Mahayana Buddhist philosophy of emptiness, asserting that there is no duality; the mind, awake or dreaming, moves through MAYA (illusion). The mind’s ignorance conceals the truth that there is no becoming and no individual soul or self (jiva), only a temporary delineation from the atman (all-soul). In the 8th century Sankara developed Advaita further, arguing that the world is unreal and that the Upanishads teach the nature of Brahman, the only reality. The extensive Advaita literature influences modem Hindu thought.

Advent In the Christian calendar, the first season of the church year, a period of preparation for the birth of Jesus. Advent begins on the Sunday nearest to November 30 and continues until Christmas. Viewed as a penitential season, it is also considered a time of preparation for the Second Coming of Christ. The origin of Advent is unknown, but it was observed as early as the 6th century. In many countries it is celebrated with popular customs such as the lighting of Advent candles.

Adventist Member of any of a group of Protestant churches that arose in the U.S. in the 19th century and believe that the Second Coming of Christ is close at hand. Adventism was founded during a period marked by millennialism by William Miller (1782-1849), a former U.S. army officer, who asserted that Christ would return to separate saints from sinners and inaugurate his 1 ,000-year kingdom on earth sometime in the year before March 21, 1844. After that date passed, Miller and his followers set a new date, Oct. 22, 1844. The “Great Disappointment” was followed by a Mutual Conference of Adventists in 1845. Those who persisted concluded that Miller had misinterpreted the signs and that, though Christ had begun the “cleansing of the heavenly sanctuary,” he would not appear until he had completed that task. These Millerites founded the Seventh-Day Adventists in 1863; other Adventist groups include the Evangelical Adventists and the Advent Christian Church. Seventh-Day Adventists observe Saturday as the Sabbath and avoid eating meat and using narcotics or stimulants.

adversary procedure In Anglo-American law, the principal method of offering evidence in court. It requires the opposing sides to present pertinent information and to introduce and cross-examine witnesses before a jury and/or a judge. Each side must conduct its own investigation. In

criminal proceedings, the prosecution represents the government and has at its disposal the police department with its investigators and laboratories; the defense must arrange and pay for its own investigation. (Legal aid is available for the poor.) In civil (noncriminal) proceedings the adversary system works similarly, except that both sides engage private attorneys to prepare their cases. Skillful questioning often produces testimony that can be interpreted in various ways; in cross-examination, lawyers seek to alter the jury’s initial perception of the testimony.

adverse possession In Anglo-American property law, holding of real property (see real and personal property) with the knowledge and against the will of one who has a superior ownership interest in it. Statutes of limitation in most U.S. states allow an adverse possessor to acquire legal title if the owner does not seek timely possession.

advertising Techniques and practices used to bring products, services, opinions, or causes to public notice for the purpose of persuading the public to respond in a certain way. Weekly newspapers in London first carried advertisements in the 17th century; by the 18th century such advertising was flourishing. The first advertising agencies were established in the 19th century to broker for space in newspapers, and by the early 20th century agencies were producing the advertising message itself, including copy and artwork. Most advertising promotes goods for sale, but similar methods are used in public service messages to promote causes, charities, or political candidates. In many countries, advertising is the most important source of income for the media through which it is conducted. In addition to newspapers, magazines, and broadcast media, advertising media

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include direct mail (see direct-mail marketing), billboards and posters, transit advertising, the Internet, and promotional items such as matchbooks or calendars. Advertisers attempt to choose media that are favoured by the advertisers’ target audience. See also marketing; merchandising.

Adwa Vad-o-woV Battle of or Battle of Adowa (March 1, 1896)
Military clash at Adwa, in north-central Ethiopia, between the Ethiopian army of King Menilek II and Italian forces. The decisive Ethiopian victory produced independence for Ethiopia and checked Italy’s attempt to build an empire in Africa comparable to that of the French or British. The colony of Eritrea was carved out in the ensuing peace negotiations.

adze or adz Hand tool for shaping wood. A handheld stone chipped to form a blade, it is one of the earliest tools, and was used widely in the Paleolithic and Neolithic periods. By Egyptian times, it had acquired a wooden haft (handle) with a copper or bronze blade set flat at the top of the haft to form a T. In this form but with a steel blade, it continued to be the prime hand tool for shaping and trimming wood; the carpenter stands on or astride a log or other piece of timber, swinging the adze like a pick, down and between the legs.

A \'a-'e\ orig. George William Russell (b. April 10, 1867, Lurgan, County Armagh, Ire. — d. July 17, 1935, Bournemouth, Hampshire, Eng.) Irish poet and mystic. A leading figure in the Irish Literary Renaissance, he published many books of verse, including Homeward (1894). Though initially considered by many to be the equal of William Butler Yeats, he did not develop as a poet, and many critics found him facile, vague, and monotonous. His pseudonym arose from a proofreader’s query about an earlier pseudonym, ^Eon.

Aegean \e-'je-on\ civilizations The Bronze Age civilizations that arose and flourished c. 3000-1000 bc in the region bordering the Aegean Sea. They included Crete, the Cyclades, the Greek mainland south from Thessaly, including the Peloponnese, and Macedonia, Thrace, and western Anatolia. The most significant were the Minoan and Mycenaean civilizations. The term also sometimes refers to Neolithic civilizations in the same region c. 7000-3000 bc.

Aegean \e-'je-on\ Islands Greek islands in the Aegean Sea, particularly the Cyclades, Sporades, and Dodecanese groups. The Cyclades consist of about 30 islands. The Dodecanese, or Southern Sporades, include Kalimnos, Karpathos, Cos, Leros, Patmos, Rhodes, and Sirni. The Sporades, or Northern Sporades, include Skyros, Skopelos, and Skiathos.

Aegean Sea Arm of the Mediterranean Sea, lying between Greece and Turkey. About 380 mi (610 km) long and 186 mi (300 km) wide, it has a total area of some 83,000 sq mi (214,000 sq km) and a maximum depth of 11,627 ft (3,543 m). The straits of the Dardanelles, the Sea of Marmara, and the Bosporus connect it with the Black Sea. The Aegean was the cradle of the great early civilizations of Crete and Greece. Thira, one of its numerous islands, has been linked with the legend of Atlantis.

Aegina \e-'jl-n9\ Island in the Saronic group of Greece. Located 16 mi (26 km) southwest of Piraeus, it has an area of 32 sq mi (83 sq km). Its chief town and port, Aegina, lies over the ancient town of the same name. Inhabited since c. 3000 bc, it became a maritime power after the 7th century bc; its period of glory, reflected in Pindar’s poetry, was in the 5th century bc. Its economic rivalry with Athens led to frequent warfare, and in 43 1 bc the Athenians deported all its population. It came under Roman rule in 133 bc. It was briefly the capital of independent Greece (1826-28). See photograph opposite.

aegirine Va-g9-,ren\ Pyroxene mineral, sodium and iron silicate (NaFe +3 Si 2 0 6), commonly found in alkaline igneous rocks, particularly in syenites (composed of an alkali feldspar and a ferromagnesian mineral) and syenite pegmatites. It also occurs in schists. Aegirine is generally dark green to greenish black.

aegis Ye-jas\ In ancient Greece, the leather cloak or breastplate associated with Zeus. It was worn most prominently by Zeus’s daughter Athena (whose aegis bore the head of Medusa) but occasionally also by other gods (e.g., Apollo in the Iliad).

Aegospotami X.e-go-'spa-to-.mlX, Battle of (405 bc) Naval victory of Sparta over Athens in the final battle of the Peloponnesian War. The Spartans under Lysander surprised the Athenians at anchor off Aegospotami, in Thrace, and defeated them decisively. The Athenians escaped with only 20 of 180 ships, and the Spartans put almost 4,000 captured Athenians to death. The victory led the Spartans to march on Athens, and the Athenians surrendered in 404 bc.

Aehrenthal Ve-ron-.talX, Aloys, Count Lexa von (b. Sept. 27, 1854, Gross-Skal, Bohemia — d. Feb. 17, 1912, Vienna, Austria-Hungary) Austro-Hungarian diplomat. As foreign minister of Austria-Hungary (1906-12), he aggressively revived the empire's dormant foreign policy. His proclamation of the annexation of Bosnia and Herzegovina in 1908 provoked fears of war with Russia, inflamed Serbia's Austrophobe passions, and drew international censure, leading to the Bosnian crisis.

Aeneas \i-'ne-os\ Mythical hero of Troy and Rome. He was the son of Aphrodite and Anchises, a member of Trojan royal family. According to Homer, he was second only to his cousin Hector in defending Troy during the Trojan War. Virgil's Aeneid tells of Aeneas's escape after Troy's fall, carrying his elderly father on his back, and of his journey to Italy, where his descendants became the rulers of Rome. See also Dido.

Aeolian harp \e-'o-le-on\ Stringed instrument played by the wind (named for the wind god Aeolus). It is usually a long, narrow, shallow box with soundholes and 10 or 12 strings strung lengthwise between two bridges. The strings are of the same length but different thicknesses and are all tuned to the same pitch; the wind makes them vibrate in successively higher harmonics. The harp may be hung, or set horizontally under a window sash. The first known Aeolian harp was constructed c. 1650 by Athanasius Kircher (1601-1680).

Aeolus \'e-9-l3s\ Greek god of the winds. In the Odyssey Homer represents Aeolus as the mortal ruler of the floating island of Aeolia. He gives Odysseus a favourable wind for his voyage and a bag in which the unfavourable winds are confined, but Odysseus's careless companions open the bag, releasing the winds and driving their ship back to shore. Later writers depicted Aeolus as a minor god rather than a human being. The Aeolian harp is named for him.

aeon or eon \'e-,an\ In Gnosticism or Manichaeism, one of the orders of spirits, or spheres of being, emanating from the godhead. The first aeon emanated directly from unmanifested divinity and was charged with divine force. Aeons increased in number and decreased in divine energy with increased remoteness from the divinity. At sufficient remoteness, error became possible and was the source of the material universe. Aeons may be viewed positively, as embodiments of the divine, or negatively, as media through which the soul must pass to reach its divine origin.

aepyornis \,e-pe-'6r-n9s\ or elephant bird Any of a group of giant flightless birds in the extinct genus Aepyornis, found as fossils in Pleis-

The temple of Aphaea, Aegina, Greece

SUSAN MCCARTNEY-PHOTO RESEARCHERS

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tocene and post-Pleistocene deposits on Madagascar. Most were massively constructed (some stood more than 10 ft, or 3 m, high) and had a small skull and a long slim neck. Remains of aepyomis and its eggs (as large as 3 ft, or 1 m, in circumference) are common. Its ancestry is uncertain.

aerarium (Saturni) Central treasury of ancient Rome, housed in the Temple of Saturn. During the republic (509-27 bc), two quaestors managed the treasury and the Senate controlled it. All revenues were paid into the aerarium, and approved payments were made from it. Under the principate (27 bc-ad 305) the aerarium lost funds and importance as emperors and magistrates bypassed Senate control and drew directly from the fisci (provincial treasuries). From ad 6 Augustus used taxes to fund the aerarium militare, a public treasury, to reward veterans, and the aerarium Saturni became the treasury of the city of Rome.

aerial See antenna

aerial perspective Method of producing a sense of depth in a painting by imitating the effect of atmosphere that makes objects look paler, bluer, and hazier or less distinct in the middle and far distance. The term was coined by Leonardo da Vinci, but the technique can be seen in ancient Greco-Roman wall paintings (e.g., at Pompeii). It was discovered that dust and moisture in the atmosphere caused the scattering of light passing through it; short-wavelength light (blue) is scattered most and long-wavelength light (red) least. Italian painters in Leonardo’s time used the device; it was exploited by 15th-century northern European artists and later by J.M.W. Turner.

aerobatics Sport of performing maneuvers such as rolls, loops, stalls, spins, and dives with an airplane. As an organized sport, rather than as an air show attraction (“stunt flying”), aerobatics began international competition in 1960 under the auspices of the Federation Aeronautique Internationale.

aerobics System of physical conditioning for increasing the efficiency of the body’s intake of oxygen. Aerobic exercises (e.g., running, jogging, swimming, dancing) stimulate heart and lung activity. To produce a benefit, aerobic training must raise the heart rate (pulse) to the exerciser’s target level for at least 20 minutes and include at least three sessions a week. The concept of aerobics was pioneered by Kenneth H. Cooper and popularized in his books Aerobics (1968) and The Aerobics Way (1977).

aerodynamics Branch of physics concerned with the forces acting on

bodies passing through air and other gaseous fluids. It explains the principles of flight of aircraft, rockets, and missiles. It is also involved in the design of automobiles, trains, and ships, and even stationary structures such as bridges and tall buildings, which must withstand high winds. Aerodynamics emerged as a discipline around the time of Wilbur and Orville Wright's first powered flight in 1903. Developments in the field have led to major advances in turbulence theory and supersonic flight.

Aeroflot \,ar-9-'fl6t\ -Russian Airlines National airline of the former Soviet Union. Founded in 1928 as Dobroflot, it was reorganized as Aeroflot in 1932. During the Soviet era Aeroflot was the world's largest airline, with about 15% of all civil air traffic. After the 1991 breakup of the Soviet Union, Aeroflot surrendered its monopoly over commercial air travel in the former Soviet states. It was renamed Aeroflot-Russian Airlines in June 2000.

aerosol System of tiny liquid or solid particles evenly distributed in a finely divided state through a gas, usually air. Aerosol particles participate in chemical processes and influence the electrical properties of the atmosphere. Though true aerosol particles range in diameter from a few nanometres to about one micrometre, the term is commonly used to refer to fog or cloud droplets and dust particles, which can have diameters of more than 100 micrometres. See also colloid; emulsion.

aerospace engineering Field concerned with the development, design, construction, testing, and operation of airplanes and spacecraft. The field has its roots in balloon flight, gliders, and airships, and in the 1960s it was broadened to include space vehicles. Principal technologies are those of aerodynamics, propulsion, structure and stability, and control. Aerospace engineers in academic, industrial, and government research centres cooperate in designing new products. Flight testing of prototypes follows, and finally quantity production and operation take place. Important developments in aerospace engineering include the metal monocoque fuselage, the cantilevered monoplane wing, the jet engine, supersonic flight, and spaceflight.

aerospace medicine Branch of medicine, pioneered by Paul Bert, dealing with atmospheric flight (aviation medicine) and space flight (space medicine). Intensive preflight simulator training and attention to design of equipment and spacecraft promote the safety and effectiveness of humans exposed to the stresses of flight and can prevent some problems. The world's first unit for space research was established in the U.S. in 1948. Physicians trained in aerospace medicine are known as flight surgeons.

Aeschines Ves-ko-.nezX (b. 390 bc — d. c. 314 bc) Athenian orator. He and Demosthenes, who later became his bitter opponent, participated in 346 bc in forging a peace between Athens and Macedonia. Demosthenes later accused Aeschines of treason because he had promoted the Macedonian cause during the negotiations. At a trial (343) Aeschines was acquitted by a narrow majority. In 339 he helped incite the war that led to the Battle of Chaeronea and to Macedonian control of central Greece. In 336 he opposed as illegal a motion to honour Demosthenes; the matter came to trial in 330, and Aeschines suffered an overwhelming defeat.

Aeschylus Ves-ko-.bsX (b. 525/524 — d. 456/455 bc, Gela, Sicily) Greek tragic dramatist. He fought with the Athenian army at Marathon (490)

and in 484 achieved the first of his many victories at the major dramatic competition in Athens. He wrote over 80 plays, but only 7 are extant; the earliest of these, Persians, was performed in 472 bc. Other plays that survive are the Oresteia trilogy (Agamemnon , The Libation Bearers, and The Eumenides), Seven Against Thebes, The Suppliants, and Prometheus Bound. Considered the father of Greek tragic drama, he added a second actor to the performance, an innovation that enabled the later development of dialogue and created true dramatic action. He was the first of the three great Greek tragedians, preceding Sophocles and Euripides.

Aesculapius See Asclepius

Aesir \'a-zir\ In Germanic religion, one of the two main groups of deities, the other being the Vanir. Odin, his wife Frigg, Tyr (the god of war), and Thor were the four Aesir common to the Germanic nations. Balder and Loki were considered Aesir by other peoples. The Aesir were a war-like race and were originally dominant over the Vanir, but after numerous defeats in battle they were forced to grant the Vanir equal status. The poet-god Kvasir was born out of the peace ritual in which the two races mingled their saliva in the same vessel.

Aesop \'e-,sap\ Supposed author of a collection of Greek fables, almost certainly a legendary figure. Though Herodotus, in the 5th century bc, said that he was an actual personage,

“Aesop” was probably no more than a name invented to provide an author for fables centring on beasts. Aesopian fables emphasize the social interactions of human beings, and the morals they draw tend to embody advice on how to deal with the competitive realities of life. The Western fable tradition effectively begins with these tales. Modern editions list some 200 Aesopian fables.

Aestheticism \es- , thet-9-,siz-9m\

Late 19th-century European arts movement that centred on the doctrine that art exists for the sake of its beauty alone. It began in reaction to prevailing utilitarian social philosophies and to the perceived ugliness and philistinism of the industrial age. Its philosophical foundations were laid by Immanuel Kant, who proposed that aesthetic standards could be separated from morality, utility, or pleasure. James McNeill Whistler, Oscar Wilde, and Stephane Mallarme raised the movement’s ideal of the cultivation of refined sensibility to perhaps its highest point. Aestheticism had affinities with French Symbolism and was a precursor of Art Nouveau.

aesthetics \es-'thet-iks\ Philosophical study of the qualities that make something an object of aesthetic interest and of the nature of aesthetic value and judgment. It encompasses the philosophy of art, which is chiefly concerned with the nature and value of art and the principles by which it should be interpreted and evaluated. Three broad approaches to the sub-

Aesop, with a fox, from the central medallion of a kylix, c. 470 bc; in the Gregorian Etruscan Museum, the Vatican

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ject have been taken, each distinguished by the types of questions it treats as foremost: (1) the study of aesthetic concepts, often specifically through the examination of uses of aesthetic language; (2) the study of the states of mind — responses, attitudes, emotions — held to be involved in aesthetic experience; and (3) the study of objects deemed aesthetically interesting, with a view to determining what about them makes them so. Seminal works in the field include the Symposium of Plato; the Rhetoric of Aristotle; Inquiry into the Original of Our Ideas of Beauty and Virtue (1725), by Francis Hutcheson (1694-1746); “Of the Standard of Taste” (in Four Dissertations [1757]), by David Hume; On the Sublime and Beautiful (1757), by Edmund Burke; Critique of Judgment (1790), by Immanuel Kant; The Sense of Beauty (1896), by George Santayana; The Psychology of Imagination (1948), by Jean-Paul Sartre; and two works by Ludwig Wittgenstein, Lectures and Conversations on Aesthetics, Psychology, and Religious Belief (1966) and Culture and Value (1977).

Aethelberht I See Ethelbert I

Aethelred Unraed See Ethelred II

Aetolia \e-'to-le-3\ District north of the Gulf of Corinth, ancient Greece. Aetolia figures prominently in early legend. By 367 bc it had been organized by various tribes into a federal state comprising the Aetolian League. Coming under Roman rule, it was incorporated into the province of Achaea (see Achaean League) in 27 bc by Augustus. Governed later by Albania and Venice, it came under Turkish rule in ad 1450. It was the scene of fierce fighting in the War of Greek Independence (1821-29). Modern Aetolia is linked with Acarnania as a department of Greece.

Aetolian \e-'to-le-3n\ League Federal state of ancient Aetolia in central Greece, probably based on a looser tribal community. A leading power by c. 340 bc, the Aetolian League resisted invasions by Macedonia in 322 and 314-311, expanded into Delphi, and allied with Boeotia c. 300. It fended off the Gauls in 279 and formed an alliance with Macedonia (c. 270-240). The league’s power in central Greece was confirmed with the defeat of the Boeotians (245). From the late 3rd century Aetolia began to lose power and territory to Macedonia, culminating in the sacking of the league’s federal capital, Thermum, by Philip V in 220. The league then

allied with Rome against Macedonia and defeated Philip at Cynosceph-
alae (197). Rome later forced it into a permanent alliance (189) that cost
it territory, power, and independence.

Afars and Issas, French Territory of the See Djibouti

Affair of the Diamond Necklace (1785) Scandal at the court of
Louis XVI that discredited the French monarchy on the eve of the French
Revolution. An adventuress, the countess de la Motte, schemed to acquire
a valuable diamond necklace by duping cardinal de Rohan into believing
that Queen Marie-Antoinette wanted to obtain it surreptitiously and that
he could gain her favour by facilitating its purchase. When the plot came
to light, Louis XVI had the cardinal arrested. Though acquitted, the arbi-
trary treatment of the cardinal deepened impressions of the autocratic
nature of the king’s government.

affective disorder Mental disorder characterized by dramatic changes
or extremes of mood. Affective disorders may include manic or depres-
sive episodes less severe than those of bipolar disorder, such as anxiety
and depression. Symptoms include elevated, expansive, or irritable
moods, with hyperactivity, pressured (rapid and forced) speech, and
inflated self-esteem; or dejected moods, characterized by lack of interest
in life, sleep disturbances, agitation, and feelings of worthlessness or guilt.

affenpinscher Va-fon-.pin-choA Sturdy breed of toy dog, known since
the 17th century. Standing 10 in. (26 cm) high or less and weighing 7-8 lbs
(3-3.5 kg), it is a TERRiER-like dog with small, erect ears, round black eyes,
and a short, docked tail. Its wiry, preferably black coat is short on parts of
the body but longer on the legs and face, where it produces the monkeylike
expression for which the breed is named (from German Affe, “ape”).

affidavit \,a-f3-'da-v3t\ Written statement made voluntarily, confirmed
by the oath or affirmation of the party making it, and signed before an
officer empowered to administer such oaths. It usually names the place
of execution and certifies that the person making it states certain facts and
appeared before the officer on a certain date and “subscribed and swore”
to the statement.

affirmative action In the U.S., the effort to improve the employment
and educational opportunities of women and members of minority groups
through preferential treatment in job hiring, college admissions, the

awarding of government contracts, and the allocation of other social ben-
efits. First undertaken at the federal level following passage of the land-
mark Civil Rights Act of 1 964, affirmative action was designed to
counteract the lingering effects of generations of past discrimination. The
main criteria for inclusion in affirmative action programs are race, sex,
ethnic origin, religion, disability, and age. The Supreme Court of the United
States placed important limitations on affirmative action programs in its
1978 ruling in Regents of the University of California v. Bakke; several sub-
sequent Supreme Court decisions (e.g., Adarand Constructors v. Pena in
1995 and Texas v. Hopwood in 1996) imposed further restrictions. In 1996
California voters passed Proposition 209, which prohibited government
agencies and institutions from discriminating against or giving preferen-
tial treatment to individuals or groups on the basis of race, sex, colour,
ethnicity, or national origin. Similar measures were subsequently passed
in other states. In 2003, in two landmark rulings involving admission to

the University of Michigan and its law school, the U.S. Supreme Court reaffirmed the constitutionality of affirmative action but ruled that race could not be the preeminent factor in such decisions.

Affleck, Thomas (b. 1745, Aberdeen, Scot. — d. 1795, Philadelphia, Pa., U.S.) Scottish-bom U.S. cabinetmaker. Trained in England, he moved to Philadelphia, where he produced outstanding furniture in the Chippendale style for Gov. John Penn and other leading citizens. The Marlborough-style leg (straight, grooved, with a block foot) and elaborate carving characterize his work.

afforestation See deforestation

Afghan hound Breed of dog developed as a hunter in the hill country of Afghanistan. It was brought to Europe in the late 19th century by British soldiers returning from the Indian- Afghan border wars. It hunts by sight, and in Afghanistan it has been used to pursue leopard and gazelle. Its high, wide hipbones are well adapted to rough country. It stands 24-28 in. (61-71 cm) high and weighs 50-60 lbs (23-27 kg). It has floppy ears, a long topknot, and a long silky coat of various colours.

Afghan wars Series of wars in Afghanistan during the 19th, 20th, and early 21st centuries. In the 19th century Britain twice invaded Afghanistan (the first and second Anglo- Afghan Wars; 1839-40 and 1878-80). The British were unable to fully subdue the country, and the third Anglo- Afghan War (1919) led to its full independence. The outbreak of civil war in 1978 led to an invasion by the Soviet Union the following year (the Afghan War). For the next 10 years the Soviets supported the communist government against a coalition of Islamic insurgents, the mujahideen, who toppled the regime in 1992. A group of disaffected fighters known as the Taliban had taken control of most of the country by 1996. The ensuing stalemate was broken in 2001 when the U.S. overthrew the Taliban for supporting international terrorism.

Afghani, Jamal al-DTn al- See Jamal al-Din al-AfghanI

Afghanistan officially Islamic State of Afghanistan Country, south-central Asia. Area: 249,347 sq mi (645,807 sq km). Population (2005 est.: 23,867,000). Capital: Kabul. About two-fifths of the people belong to the Pashtun ethnic group; other ethnic groups include Tajiks, Uzbeks, and Hazara. Languages: Pashto, Persian (both official). Religions: Islam (official; predominantly Sunni); also Zoroastrianism. Currency: afghani. Afghanistan has three distinctive regions: the northern plains are the major agricultural area; the southwestern plateau consists primarily of desert and semiarid landscape; and the central highlands, including the Hindu Kush, separate these regions. Afghanistan has a developing economy based largely on agriculture; its significant mineral resources remain largely untapped because of the Afghan War of the 1980s and subsequent fighting. Traditional handicrafts remain important; woolen carpets are a

major export. The area was part of the Persian Achaemenian Empire in the 6th century bc and was conquered by Alexander the Great in the 4th century bc. Hindu influence entered with the Hephthalites and Sasanians; Islam became entrenched during the rule of the Saffarids, c. ad 870.

Afghan hound

SALLY ANNE THOMPSON

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UZBEKISTAN

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AFGHANISTAN

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TURKMENISTAN

IRAN

Afghanistan was divided between the Mughal Empire of India and the Safavid empire of Persia until the 18th century, when other Persians under Nadir Shah took control. Britain fought several wars in the area in the 19th century. From the 1930s the country had a stable monarchy, which was overthrown in the 1970s. Marxist reforms sparked rebellion, and Soviet troops invaded. Afghan guerrillas prevailed, and the Soviets withdrew in 1989. In 1992 rebel factions overthrew the government and established an Islamic republic. In 1996 the Taliban militia took power in Kabul and enforced a harsh Islamic order. The militia's unwillingness to extradite extremist leader Osama bin Laden and members of his al-Qaeda militant organization following the September 1 1 attacks in 2001 led to military conflict with the U.S. and allied nations, the overthrow of the Taliban, and the establishment of an interim government.

AFL-CIO in full American Federation of Labor-Congress of Industrial Organizations U.S. federation of labour unions formed in 1955 by the merger of the AFL and the CIO. The AFL was founded in 1886 as a loose federation of craft unions under the leadership of Samuel Gompers. Member unions retained autonomy and received protection of their workers and jurisdiction over a certain industrial territory. The CIO was founded in 1935 as the Committee for Industrial Organization by a splinter group of AFL unions whose leaders believed in organizing skilled and unskilled workers across entire industries; at its first convention in 1938, it adopted its current name and elected John L. Lewis president. For two decades the AFL and CIO were bitter rivals for the leadership of the U.S. labour movement, but they formed an alliance in the increasingly conservative, antilabour climate of the postwar era, and in 1955 they merged under the leadership of George Meany. AFL-CIO membership reached 17 million in the late 1970s but declined from the 1980s as the U.S. manufacturing sector shrank. AFL-CIO activities include recruiting and organizing members, conducting educational campaigns, and supporting political candidates and legislation deemed beneficial to labour. See also Lane Kirkland; Knights of Labor; Walter Reuther.

Aflaq Vaf-lak\, Michel (b. 1910, Damascus, Syria — d. June 23, 1989, Paris, France) Syrian social and political leader. While studying at the University of Paris (1929-34), he came to believe that the Arab nationalist struggle had to oppose both the native aristocracy and foreign rulers. Hoping to unite all the Arab states into a single socialist nation through nonviolence, he helped establish the Ba c th Party in 1946 and served as its teacher, theorist, and organizer. He persuaded the Syrian government to form the United Arab Republic with Egypt in 1958, but Syria withdrew from it in 1961. His career in Syrian politics ended in 1966 when he moved to Lebanon. See also Pan-Arabism.

aflatoxin X.a-fta-'tak-sonN Complex of toxins formed by molds of the genus Aspergillus, which frequently contaminate improperly stored nuts (especially peanuts), grains, meals, and certain other foods. Discovered after an outbreak of "turkey X disease" in England in 1960, aflatoxins may cause liver disease and cancer and may trigger Reye syndrome.

Afonso I known as Afonso the Conqueror (b. 1109/11, Guimaraes. Port. — d. Dec. 6, 1185, Coimbra) First king of Portugal (1139-85). He defeated his mother to take the throne (1128), ruling first as a vassal of his cousin Alfonso VII of Leon but later securing Portuguese independence and gaining the title of king (1139). He defeated nearby Muslims and imposed tribute on them, then took Lisbon (1147) with the help of Crusaders. Afonso eventually extended Portugal beyond the Tagus River. He shared power with his son Sancho I and left him a stable, independent monarchy.

Afonso III (b. May 5, 1210, Coimbra, Port. — d. Feb. 16, 1279, Lisbon) King of Portugal (1248-79). He emigrated to France and became, by marriage, count of Boulogne. He gained the Portuguese crown when his older brother Sancho II was deposed by order of the pope. As king, Afonso regained control of the district of Faro (1249) and completed the reconquest of the Algarve from the Muslims. His reign saw the first admission of commoners to the Portuguese Cortes (parliament). Afonso's assertion of the royal right to repossess church lands led to his excommunication by the pope.

Afonso the Great See Afonso de Albuquerque

Africa Second largest continent on Earth. It is bounded by the Mediterranean Sea, the Atlantic Ocean, the Red Sea, and the Indian Ocean and is divided almost equally by the Equator. Area: 11,717,370 sq mi (30,348,110 sq km). Population (2001 est.): 816,524,000. Africa is composed largely of a rigid platform of ancient rocks that underlies vast plateau regions in the interior. Its average elevation is about 2,200 ft (670 m), but elevations range from 19,340 ft (5,895 m) at Mount Kilimanjaro to 515 ft (157 m) below sea level at Lake Assal. The Sahara, the world's largest contiguous desert, occupies more than one-fourth of the total land area. The continent's hydrology is dominated by the Nile River in the north, the Niger River in the west, and the Congo River in central Africa. Less than one-tenth of the land area is arable, while nearly one-fourth is forested or wooded. The peoples of Africa probably speak more languages than those of any other continent. Arabic is predominant from Egypt to Mauritania and in The Sudan. Northern Africans speak a family of languages known as Afro-Asiatic. The vast majority of sub-Saharan peoples speak Bantu languages of the Niger-Congo family, while smaller numbers in central Africa speak Nilo-Saharan languages and in southern Africa Khoisan languages. Peoples of European descent are found mostly in the south; Dutch (Boer) migrations began in the 17th century, and the English first settled in what is now Kenya and Zimbabwe in the 19th century. Africa as a whole is a developing region. Agriculture is the key sector of the economy in most countries. Diamond and gold mining are especially important in the south, while petroleum and natural gas are produced particularly in the west. Most African governments are controlled by the military or a single party. Many legal systems combine laws introduced by European powers during the colonial era with traditional law, though North African countries derive many laws from Islam. African leaders have sought to develop a pan- African approach to the continent's political and military affairs through the Organization of African Unity and its successor, the African Union. Africa is widely recognized as the birthplace of humankind. Archaeological evidence indicates that the continent has been inhabited by humans and their hominid forebears for some 4,000,000 years or more. Anatomically modern humans are believed to have appeared about 100,000 years ago in the eastern region of sub-

Saharan Africa. Somewhat later these early humans spread into northern Africa and the Middle East and, ultimately, to the rest of the world. Africa's first great historical kingdom, Egypt, arose along the Nile c. 3000 bc and flourished for nearly 3,000 years. The Phoenicians established a colony at Carthage and controlled the western Mediterranean for nearly 600 years. While northern Africa was dominated by the Romans for several centuries, the first known empire in western Africa was Ghana (5th— 1 1th century ad). Muslim empires included those of Mali (c. 1250-1400) and Songhai (c. 1400-1591). In eastern and central Africa the emphasis was on trade with Arabia, and several powerful city-states, including Mogadishu and Mombasa, were established. The Portuguese explored the western coast in the 15th century. Before the late 19th century, Europe showed little interest in colonizing Africa, but by 1884 European countries had

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begun a scramble to partition the continent, and by 1920 much of it was under colonial rule. Anticolonial sentiment developed gradually, becoming widespread after 1950, and one by one the colonies became independent, the last in 1990. Political instability, refugee problems, famine, and AIDS are the chief problems facing the continent at the start of the 21st century. See map on following page.

Africa Proconsular Roman province. It was founded after Rome defeated Carthage in 146 bc and was subsequently extended to include Numidia and the northern part of modem Libya. Between 30 bc and ad 180, other parts of northern Africa, including Cyrenaica and Mauretania, became part of the Roman Republic and Empire. In the 5th century the region was taken by the Vandals, though areas were later reconquered by the Byzantine (Eastern Roman) Empire; the Muslims conquered the area in the late 7th century.

Africa, Horn of See Horn of Africa

African ant bear See aardvark

African arts Visual, performing, and literary arts of sub-Saharan Africa. What gives art in Africa its special character is the generally small scale of most of its traditional societies, in which one finds a bewildering variety of styles. The earliest evidence of visual art is provided by figures scratched and painted on rocks c. 3000 bc. Pastoral cultures in the east emphasize personal adornment; sculpture predominates in the agricultural societies in the west and south. Clay figurines found in Nigeria date to 500 bc. Metalworking was practiced from the 9th century ad. Sculptures in stone, ivory, and wood date from the 16th- 17th centuries; some of the finest wood sculptures date from the 20th century. Architecture dominates the arts of the north and of the eastern coast, where Islam and Christianity exerted their influence; important work includes magnificent mosques built of mud and rock-hewn churches. Perhaps the most distinctive features of African music are the complexity of rhythmic pat-

terning achieved by a great variety of drums and the relationship between melodic form and language tone structure. Without this the text of a song is rendered meaningless; but, even in purely instrumental music, melodic pattern is likely to follow speech tone. Dances are realized in radically different styles throughout Africa. Movement patterns often depend upon the way in which environmental, historical, and social circumstances have been articulated in working, social, and recreational movements. Often there is no distinction between ritual celebration and social recreation. The masquerade is a complex art form employing many media; masquerades may entertain, be used to fight disease, be consulted as oracles, initiate boys to manhood, impersonate ancestors, judge disputes, or execute criminals. The mask is essentially a dramatic device enabling performers to stand apart from their everyday role in the community. The content and style of urban African theatre are influenced by both African dramatic traditions and Western theatre. The literary arts of Africa — especially its oral traditions — are immensely rich and varied. They include myths, praise songs, epic poetry, folktales, riddles, spells, and proverbs. Written literatures have existed for several centuries in Hausa, Swahili, and Amharic. In the 20th century, written literatures in other African languages also developed, alongside those in English, French, and Portuguese. See also Buu style; deble; segoni-kun; telum figure; trickster tale; and African authors by name, such as Chinua Achebe; Aime Cesaire; Birago Diop; Athol Fugard; Nadine Gordimer; Wole Soyinka; Amos Tutuola.

African languages Languages indigenous to Africa that belong to the Niger-Congo, Nilo-Saharan, Khoisan, and Afro-Asiatic language phyla. Africa is the most polyglot continent; estimates of the number of African languages range from 1,000 to more than 1,500. Many have numerous dialects. Distinctions in tone play a significant role in nearly all sub-Saharan languages. Contact between people who do not speak the same language has necessitated the development of lingua francas such as Swahili in East Africa, Lingala in the Congo River basin (see Bantu languages), Sango in the Central African Republic (see Adamawa-Ubangi languages), and Arabic across much of the Sahel.

African lily or lily of the Nile Perennial evergreen herbaceous plant {Agapanthus africanus) of the lily family, native to Africa. In summer, long stalks bear many funnel-shaped flowers. The attractive, thick, dark green leaves are sword-shaped. There are many varieties, some with white or purple flowers and others with patterned leaves. If grown in a climate with frost, they must be kept in containers and moved indoors to survive the cold weather.

African lion dog See Rhodesian ridgeback

African Methodist Episcopal Church (AME Church) African American Methodist denomination formally organized in 1816. It originated with a group of black Philadelphians who withdrew in 1787 from St. George's Methodist Episcopal Church (see Methodism) because of racial discrimination and built Bethel African Methodist Church. In 1799 Richard Allen became minister of Bethel, and in 1816 he was consecrated bishop of the newly organized African Methodist Episcopal Church. Limited at first to the Northern states, the church spread rapidly in the South after the Civil War. It founded many colleges and seminaries, notably Wilberforce University (1856) in Ohio. In the late 20th century the church claimed 3,500,000 members and 8,000 congregations. Its headquarters are in Washington, D.C.

African National Congress (ANC) South African political party and black nationalist organization. Founded in 1912 (as the South African Native National Congress), the ANC was long dedicated to the elimination of apartheid. In response to government massacres of demonstrators at Sharpeville (1960) and Soweto (1976), it carried out acts of sabotage and guerrilla warfare. The campaign was largely ineffective because of stringent South African internal security measures, including an official ban on the ANC between 1960 and 1990. In 1991, with the ban lifted, Nelson Mandela succeeded Oliver Tambo as ANC president. In 1994 the party swept the country's first elections based on universal suffrage; the ANC led a coalition government that initially included members of its longtime rival, the National Party, and Mandela became South Africa's president. In 1999 Thabo Mbeki replaced him as president of the ANC and of South Africa. See also Inkatha Freedom Party; Albert Lutuu; Pan-African movement.

African religions Indigenous religions of the African continent. The introduced religions of Islam (in northern Africa) and Christianity (in southern Africa) are now the continent's major religions, but traditional religions still play an important role, especially in the interior of sub-Saharan Africa. The numerous traditional African religions have in common the notion of a creator god, who made the world and then withdrew, remaining remote from the concerns of human life. Prayers and sacrificial offerings are usually directed toward secondary divinities, who are intermediaries between the human and sacred realms. Ancestors also serve as intermediaries (see ancestor worship). Ritual functionaries include priests, elders, rainmakers, diviners, and prophets. Rituals are aimed at maintaining a harmonious relationship with cosmic powers, and many have associated myths that explain their significance. Animism is a common feature of African religions, and misfortune is often attributed to WITCHCRAFT AND SORCERY.

African Union (AU) African intergovernmental organization. It is the successor to the Organization of African Unity (OAU). The AU was established in 2002 to promote unity and solidarity among African states, spur economic development, and promote international cooperation. The OAU was established in 1963 with similar goals, and during its tenure the group mediated several border disputes on the African continent. More economic in nature and with a stronger mandate to intervene in conflicts, the AU replaced the OAU in 2002. In 2004 the AU's Pan-African Parliament was inaugurated, and the organization agreed to create a peacekeeping force. The AU's headquarters are in Addis Ababa, Eth.

African violet Any plant of the genus Saintpaulia, of the gesneriad family, especially S. ionantha. African violets are native to high elevations in tropical eastern Africa. They are small, hairy, usually stemless herbaceous plants with crowded, long-stalked leaves. The violet, white, or pink flowers bloom most of the year. They are popular houseplants, and hundreds of varieties have been developed, including half-sized miniatures.

Afrikaans \,af-ri-'kanz\ language Germanic language of South Africa. It was developed from 17th-century Dutch by descendants of European settlers, indigenous KHOlSAN-speaking peoples, and African and Asian slaves in the Dutch colony at the Cape of Good Hope. It differs from Dutch in its sound system, in some grammatical simplification, and in vocabulary. Afrikaans is spoken as a first language by close to six million South Africans and as a second or third language by several million more; there are

also about 150,000 Afrikaans speakers in Namibia. Standard Afrikaans was formally separated from Dutch and made an official language in South Africa in 1925; it is one of 11 official South African languages.

Afrikaner V.af-ri-'kan-or \ formerly Boer Historically, any South African of Dutch or Huguenot descent whose native language is Afrikaans. Beginning in the late 20th century, the term also was used for all Afri-

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kaans speakers, regardless of ethnicity. The Afrikaners were originally called Boers (“farmers”), since many Dutch and Huguenot settlers of the old Cape Colony (founded 1652) became frontier farmers in the Transvaal and the Orange Free State. They established self-sufficient patriarchal communities, developed their own language and subculture, and were committed to a policy of racial segregation, later referred to as apartheid. They fought a bitter war with the British (the South African War, 1 899—1902) over the right to govern the frontier territories. Though defeated, they retained their old language and culture and eventually attained politically the power they had failed to win militarily. They dominated South African politics for most of the 20th century but were obliged to give up national power after the first elections based on universal suffrage in 1994. See also Cape Town; Great Trek; National Party.

Afro-Asiatic languages formerly Hamito-Semitic languages

Family of about 250 languages spoken in North Africa, parts of sub-Saharan African, and the Middle East. It includes such languages as Arabic, Hebrew, Amharic, and Hausa. The total number of speakers is estimated to be more than 250 million. The major branches of Afro-Asiatic are Semitic, Berber, Egyptian, Cushitic, Omotic, and Chadic. Berber languages are spoken by perhaps 15 million people in enclaves scattered across North Africa from Morocco to northwestern Egypt and in parts of the western Sahara. Cushitic consists of some 30 languages spoken by more than 30 million people in northeastern Sudan, Eritrea, Ethiopia, Somalia, Djibouti, Kenya, and a few areas of northeastern Tanzania. Omotic, formerly classified as part of Cushitic, is a cluster of perhaps more than 30 languages spoken by 2-3 million people, most of whom live near the Omo River in southwestern Ethiopia. Chadic comprises about 140 languages, spoken in northern Nigeria, southern Niger, southern Chad, and northern

Cameroon; except for Hausa, it is likely that no individual Chadic language has more than half a million speakers.

Afro-Caribbean, Afro-Brazilian, and Afro-American religions Religions among persons of African ancestry in the Caribbean, Brazil, and U.S. These include Haitian vodun, the Jamaican Rastafarian movement, Santeria, and Candomble and other Macumba sects in Brazil. Similarly syncretistic religions appeared in the U.S. during the era of slavery. The Nation of Islam combines black nationalism with an unorthodox version of Islam. Black Protestant churches (especially Baptist and Pentecostal) have imported some forms of lively worship from Africa.

Afrocentrism Cultural, political, and ideological movement. Most Afrocentrists are African Americans who regard all blacks as syncretic Africans and who believe that their worldview should positively reflect traditional African values. Afrocentrists argue that for centuries blacks and other nonwhites have been dominated, through slavery and colonization, by Europeans and that European culture is either irrelevant or hostile to efforts by non-Europeans to achieve self-determination. Rooted in historical black nationalist movements such as Ethiopianism, Pan-Africanism, and Negritude, Afrocentrism asserts the cultural primacy of ancient Egypt and is seen as a spur to political activism. In addition to emphasizing cooperation and spirituality, it champions contemporary African American expressive culture (language, cuisine, music, dance, and clothing). Coined by Molefi Asante in the 1980s, the term Afrocentrism was popularized by such books as Black Athena: The Afroasiatic Roots of Classical Civilization, 2 vol. (1987-91), by Martin Bernal. The book remains controversial among mainstream scholars who charge it with historical inaccuracy, scholarly ineptitude, and racism — prompting countercharges of racism from some of its defenders.

afterburner Second combustion chamber in a turbojet or turbofan engine, immediately in front of the engine's exhaust nozzle. The injection and combustion of extra fuel in this chamber provide additional thrust for takeoff or supersonic flight; in most cases, the afterburner can nearly double the thrust of a turbojet engine. The jet nozzle must be larger when using the afterburner, so an automatic, adjustable nozzle is an essential component of the afterburner system. Because the afterburner sharply increases fuel consumption and is generally less effective at subsonic speeds, its use is usually restricted to supersonic military aircraft.

afterpiece Supplementary entertainment offered after a full-length play in 1 8th-century England. A short comedy, farce, or pantomime was presented to lighten the five-act Neoclassical tragedy that was commonly performed. A reduced admission price for latecomers, usually after the third act, enabled less-sophisticated playgoers and working people to see the end of the drama and the one-act afterpiece.

aftosa See foot-and-mouth disease

Aga Khan \,a-g9-'kan\ Persian Agha Khan or Aqa Khan Title of the imams of the Nizarl Isma'ili sect of ShTite Islam. The title was first granted in 1818 to Hasan 'All Shah (1800-81) by the shah of Iran. As Aga Khan I, he later revolted against Iran (1838) and, defeated, fled to India. His eldest son, 'All Shah (d. 1885), was briefly Aga Khan II. 'All Shah's son Sultan Sir Mohammed Shah (1877-1957) became Aga Khan III. He acquired a leading position among India's Muslims, served as president

of the All-India Muslim League, and played an important part in the Round Table conferences on Indian constitutional reform (1930-32); in 1937 he was appointed president of the League of Nations. He chose as his successor his grandson Karim al-Husayn Shah (b. 1937), who, as Aga Khan IV, became a strong leader; he founded the Aga Khan Foundation, an international philanthropic organization, and other agencies offering educational and other services.

Agadir \,a-ga-'dir\ Seaport city (pop., 1994: 155,240), southwestern Morocco on the Atlantic coast. It was occupied in the 16th century by the Portuguese but later became an independent Moroccan port. After the 1911 Moroccan Crisis, it was occupied by French troops in 1913. Modern growth began with the port's construction in 1914 and the development of the fishing industry. In 1960 the city was virtually destroyed by a pair of earthquakes, a tidal wave, and a fire; a new city centre was rebuilt south of its original location. It is also a marketplace for the surrounding agricultural area.

Agamemnon ^a-go-'mem-.nanX In Greek legend, the son of Atreus, brother of Menelaus, and king of Mycenae and commander of the Greek forces that attacked Troy. By his wife, Clytemnestra, Agamemnon had a son, Orestes, and three daughters. When Paris carried off Menelaus' s wife, Helen, Agamemnon called on the Greeks to unite in a war of revenge against the Trojans. Artemis sent a calm or contrary winds to prevent the Greek fleet from sailing, and Agamemnon sacrificed his daughter Iphigeneia to appease the goddess. After the Trojan War he returned home, where he was killed by his wife and her lover, Aegisthus. His murder was avenged by Orestes. These events formed the basis of Aeschylus' great dramatic trilogy the Oresteia.

Agana See Hagatna

agape \a-'ga-pa\ In the New Testament, the fatherly love of God for humans and their reciprocal love for God. The term extends to the love of one's fellow humans. The Church Fathers used the Greek term to designate both a rite using bread and wine and a meal of fellowship that included the poor. The historical relationship between this meal, the Lord's Supper, and the Eucharist, the meal of fellowship and the sacrament, is uncertain.

agaric Va-g9r-ik\ Any fungus of the family Agaricaceae, including the familiar commercially grown mushroom. Agarics have SPORE-bearing cells (basidia) located on thin sheets called gills. Best known of the agarics is the genus Agaricus (Psalliota), which includes some 60 species, the most prominent being the edible meadow, or field, mushroom, A. campestris, and the common cultivated mushroom, A. bisporus.

Agartala Xo-'gsr-to-bX City (pop., 2001 prelim.: 189,387), capital of Tripura state, India. It lies near the Bangladesh border on the Haroa River in an intensively cultivated plain. The commercial centre of the area, it also contains a maharaja's palace, a temple, and several colleges affiliated with the University of Calcutta.

Agassi \ , a-go-se\ / Andre (Kirk) (b. April 29, 1970, Las Vegas, Nev., U.S.) U.S. tennis player. Agassi won the Wimbledon men's singles in 1992, the U.S. Open in 1994, and the Australian Open in 1995. By 1997 he had dropped to 122 in the international rankings, but he recovered to become the world's top-ranked player by 2000. In 2001 he married retired

German tennis player Steffi Graf. Agassi is known for his aggressive style and demeanour on and off the court.

Agassiz \'a-go-se\, Alexander (Emmanuel Rodolphe) (b. Dec. 17, 1835, Neuchatel, Switz. — d. March 27, 1910, at sea, mid- Atlantic Ocean) Swiss-born U.S. marine zoologist, oceanographer, and mining engineer. The son of Louis Agassiz, he emigrated in 1 849 to the U.S. , where he conducted significant systematic zoological work on echinoderms (e.g., starfish). He developed and supervised what became the world's foremost copper mine (Calumet, Mich.) while also improving conditions for miners. He also pursued marine and coral reef studies. His observations made

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on an 1875 trip to the western coast of South America led him to challenge Charles Darwin's theory of coral reef formation.

Agassiz, Elizabeth Cabot orig. Elizabeth Cabot Cary (b. Dec. 5, 1822, Boston, Mass., U.S. — d. June 27, 1907, Arlington Heights, Mass.) U.S. naturalist and educator. She was educated at home, and in 1850 she married Louis Agassiz. She helped organize and manage several of his field expeditions, and together they founded a marine laboratory in Buzzards Bay, Mass. After his death she pursued her idea of a college for women to be taught by the Harvard University faculty. She was instrumental in launching the Society for the Collegiate Instruction of Women (1882); she served as its president until 1894, when it was renamed Radcliffe College, and she continued as president until 1899.

Agassiz Va-go-seV (Jean) Louis (Rodolphe) (b. May 28, 1807, Motier, Switz. — d. Dec. 14, 1873, Cambridge, Mass., U.S.) Swiss-born U.S. naturalist, geologist, and teacher. After studies in Switzerland and Germany, he moved to the U.S. in 1846. He did landmark work on glacier activity and extinct fishes. He became famous for his innovative teaching methods, which encouraged learning through direct observation of nature, and his term as a zoology professor at Harvard University revolutionized the study of natural history in the U.S.; every notable American teacher of natural history in the late 19th century was a pupil either of Agassiz or of one of his students. In addition, he was an outstanding science administrator, promoter, and fund-raiser. He was a lifelong opponent of Charles Darwin's theory of evolution. His second wife, Elizabeth Agassiz, cofounder and first president of Radcliffe College, and his son, Alexander Agassiz, were also noted naturalists.

agate \'a-got\ Common, semiprecious silica mineral, a variety of chalcedony that occurs in bands of varying colour and transparency.

Varieties are characterized by peculiarities in the shape and colour of the bands, which are seen in sections cut at right angles to the layers.

Agate is found throughout the world, commonly in cavities in eruptive rocks and in geodes. Brazil and Uruguay are major producers of agates; they are also found in Oregon, Washington, Idaho, Montana, and other western U.S. states. Agate is essentially quartz. Much commercial agate is artificially dyed to make the naturally dull-gray stones more colourful.

Agate Fossil Beds National Monument Natural “depository” of an extinct animal community on the Niobrara River, northwestern Nebraska, U.S. The beds, laid down as sedimentary deposits 20 million years ago, bear the remains of prehistoric mammals. Discovered c. 1878, the site was named for its proximity to rock formations containing agates. A national monument since 1965, it covers 2,269 acres (918 hectares).

Agatha, Saint (fl. 3rd century ad?, Sicily; feast day February 5) Legendary Christian martyr. Born in Palermo or Catania, she resisted the advances of a Roman prefect sent to govern Sicily. After brutal torture she was sent to the stake, but as the fire was lit a great earthquake occurred, and the crowd demanded her release. She was led away to prison, where she died. Though she appears in lists of martyrs as early as the 6th century, the legend may be unfounded.

Agathocles \3-'ga-th3-klez\ (b. 361 bc, Thermae Himeraeae, Sicily — d. 289) Tyrant of Syracuse (317-304?) and self-styled king of Sicily (304?-289). He moved to Syracuse as a youth and served in its army. After two failed attempts, he overthrew the Syracusan oligarchy (317) and took power. He waged wars with other Sicilian Greek cities (316-313?) and with Carthage (311), almost capturing Carthage itself before he was defeated (307). He concluded a favourable treaty (306) that curtailed Carthaginian expansion in Sicily. Harsh domestic measures kept him in power, and he declared himself king of Sicily; his reign was peaceful thereafter. He restored Syracusan liberty in his will, but after his death the Carthaginians were once again a power in Sicily.

agave \o-'ga-ve\ family Family Agavaceae of the lily order (Liliales), comprising more than 700 species of short- stemmed, often woody plants found in tropical, subtropical, and temperate areas. They have narrow, lance-shaped, sometimes fleshy or toothed leaves, which are clustered at the base of the plant. Most have large flower clusters. The fruit is a capsule or berry. Plants of the genus Agave are important primarily for the fibres obtained from their leaves. Sisal hemp, from A. sisalana, is the most valuable hard fibre. Some species of Agave contain a sap that is fermented to produce the intoxicating drinks known as tequila, pulque, and mescal. Many species of yucca are popular as ornamentals; other ornamentals in the agave family include plants of the genera Dasylirion, Nolina, Cordyline , Dracaena , and Sansevieria.

age set Formally organized social group consisting of every male (or female) of comparable age. In societies where the practice traditionally occurs (e.g., the Nuer of the southern Sudan or the Masai of Kenya and Tanzania), a person belongs, either from birth or from a determined age,

to a named age set that passes through a series of life stages, or age grades, each of which has a distinctive status or social and political role. See also rite of passage; social status.

Agee \'a-je\, James (b. Nov. 27, 1909, Knoxville, Tenn., U.S. — d. May 16, 1955, New York, N.Y.) U.S. poet and novelist. Agee attended Harvard University. In the 1930s and ’40s, film reviews for Time and The Nation made him a pioneer in serious film criticism. His lyrical Let Us Now Praise Famous Men (1941), with photographs by Walker Evans, documents the daily lives of poverty-stricken Alabama sharecroppers. After 1948 Agee worked mainly as a screenwriter, notably on The African Queen (1951) and The Night of the Hunter (1955). He is best known for his autobiographical novel A Death in the Family (1957, Pulitzer Prize).

Agenais \azh-'ne, a-zho-'na\ or Agenois \a-zhe-'nwa\ Historical region, southwestern France. In ancient Gaul, Agenais was the country of the Nitiobriges, then a Gallo-Roman civitas, whose limits became those of the diocese of Agen. It was acquired by the dukes of Aquitaine in 1036. When Eleanor of Aquitaine married the future Henry II of England in 1152, Agenais became the possession of the English kings. It alternated between French and British rule until it was reunited to the French crown in 1615.

Agence France-Presse \a-zha n s-fra n s-'pres\ (AFP) French cooperative news agency. Based in Paris, it has roots in the Bureau Havas, created in 1832, which in 1835 became the Agence Havas, the world’s first true news agency. The Agence Havas was active until the German occupation of France in 1940, when many of its personnel went underground. After the liberation of Paris in 1944, underground journalists emerged to form AFP. The French government assigned the assets of Agence Havas to AFP, which quickly became one of the world’s leading wire news services. AFP operates bureaus in Africa, Asia-Pacific countries, Latin America, the Middle East, North America, and Europe.

agency In law, a relationship in which one party (the agent) acts on behalf of and under the control of another (the principal) in dealing with third parties. It has its roots in ancient servant-master relations. Agency becomes a legal issue when the agent injures or wrongs a third party. In Anglo-American law, principals are bound by and liable for the acts of such agents as stockbrokers, business agents, contractors, real-estate agents, lawyers, union representatives, managing partners, and private detectives. See also regulatory agency.

agenesis \a-'je-no-s9s\ Failure of all or part of an organ to develop during embryonic growth. Many forms of agenesis are lethal, such as absence of the entire brain (anencephaly), but agenesis of one organ of a pair may cause little problem. Agenesis of a kidney, bladder, testicle, ovary, thyroid, and lung are known. Agenesis of the arms or legs is called meromelia (absence of one or both hands or feet), phocomelia (normal hands and feet but no arms or legs), and amelia (complete absence of a limb or limbs). Agenesis may be caused by absence of embryonic tissue or by chemical exposure in the uterus, and it is often associated with other congenital disorders.

Agent Orange Mixture of herbicides. It contains approximately equal amounts of esters of 2,4-D (2, 4-dichlorophenoxy acetic acid) and 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) and trace amounts of dioxin. About 13 million gallons were sprayed by U.S. military forces onto Vietnam’s forests and crops during the Vietnam War, with the dual purpose of destroy-

ing cover for enemy movements and destroying food sources. Exposure to Agent Orange has been blamed for an abnormally high incidence of miscarriages, skin diseases, cancers, birth defects, and malformations among Vietnamese and of cancers and other disorders in U.S. , Australian, and New Zealand servicemen and their families.

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ageratum y.a-js-'ra-tsmV Any plant of the genus Ageratum, of the composite family, native to tropical South America. Ageratum have toothed, oval leaves that are opposite each other on the stem; compact clusters of blue, pink, lilac, or white flowers; and small, dry fruits. Dwarf varieties are used as edging plants. Some ageratum are variously known as floss-flower and pussyfoot.

Agesilaus \3-je-s3-'la-9s\ II (b. c. 444 bc — d. 360, Cyrene, Cyrenaica) King of Sparta (399-360) and commander of its army during most of the era of Spartan supremacy (404-371). A member of the Eurypontid family, he took the throne with Lysander’s help while Sparta was fighting Persia. He defeated the allied Thebes, Athens, Argos, and Corinth in the Corinthian War (395-387), despite losing some ground in central Greece and a battle with the Persian fleet in 394. He dissolved the Boeotian League, but battles against the Boeotian Confederacy (371) and Thebes (370, 361) ended Sparta’s ascendancy. He died en route to Sparta from a mercenary engagement in Egypt.

agglomerate No-'gla-mo-roA Large, coarse, angular rock fragments associated with lava flow that are ejected during explosive volcanic eruptions. Although they may appear to resemble sedimentary conglomerates, agglomerates are igneous rocks that consist almost wholly of angular or rounded lava fragments of varying size and shape. Some geologists sort agglomerates into bombs, blocks, and breccia. Bombs are ejected in a molten state, becoming rounded upon solidification, and blocks are erupted as solid fragments. Upon accumulation and solidification of the angular fragments (also known as pyroclastics), they form agglomerates.

aggressive behaviour Any action of an animal intended to injure an opponent or prey animal or to cause an opponent to retreat. Aggression may be caused by various stimuli. Within its own group, an animal must display aggressive postures to maintain its position within the hierarchy (e.g., the pecking order of chickens). A threat by itself, as in ruffled feathers or teeth revealed in a snarl, is usually sufficient to maintain an already-established social order. Aggression often occurs just before mating season, when males win their choice of females and territories.

Agha Khan See Aga Khan

Aghlabid Vag-ls-bidX dynasty (800-909) Arab Muslim dynasty that ruled Ifriqiyyah (Tunisia and eastern Algeria) through a succession of 1 1

emirs. Nominally subject to the ‘Abbasid dynasty, they in fact were independent. High points of Aghlabid rule included the conquest of Sicily (827-829), the flowering of their capital city, Kairouan (9th century), and naval control of the central Mediterranean Sea. Public works included a system for conserving and distributing water.

Agiads \'a-je-odz\ Line of Spartan kings named after Agis I (11th century bc?). Agis was traditionally held to be the son of one of the legendary twins who founded Sparta. Agis II (d. 400/398 bc) commanded the Spartan army during most of the Peloponnesian War (431-404) against Athens. Agis III (d. 331 bc) led the Greek cities in an unsuccessful revolt against Alexander the Great. The last of the line was Agis IV (d. 241 bc), who failed in his attempt to reform the unequal distribution of land and wealth in Sparta, ultimately losing his crown and his life to Leonidas II.

Agincourt \'a-jin-kort\, Battle of (October 25, 1415) Battle resulting in the decisive victory of the English over the French in the Hundred Years' War. In pursuit of his claim to the French throne, Henry V invaded Normandy with an army of 11,000 men in August 1415. The English took Harfleur in September, but with their forces cut in half by battle and disease, they resolved to return to England. At Agincourt they were cornered by a French army of 20,000-30,000 men, including many mounted knights in heavy armor. On a cramped battlefield where the superior French numbers offered little advantage, Henry made skillful use of his lightly equipped, mobile archers. The French were disastrously defeated, losing over 6,000 men, while the English lost fewer than 450.

aging Gradual change in an organism that leads to increased risk of weakness, disease, and death. It takes place in a cell, an organ, or the total organism over the entire adult life span of any living thing. There is a decline in biological functions and in ability to adapt to metabolic stress. Changes in organs include the replacement of functional cardiovascular cells with fibrous tissue. Overall effects of aging include reduced immunity, loss of muscle strength, decline in memory and other aspects of cognition, and loss of colour in the hair and elasticity in the skin. In women, the process accelerates after menopause. See also gerontology and geriatrics.

agitprop Va-jst-.prapX Political strategy in which techniques of agitation and propaganda are used to influence public opinion. Originally described by the Marxist theorist Georgy Plekhanov and then by Vladimir Ilich Lenin, it called for both emotional and reasoned arguments. The term, a shortened form for the Agitation and Propaganda Section of the Communist Party in the former Soviet Union, has been used in English, typically with a negative connotation, to describe any work — especially in drama and other art forms — that aims to indoctrinate the public and achieve political goals.

Agnes, Saint (fl. 4th century, Rome; feast day January 21) Legendary Christian martyr, the patron saint of girls. According to tradition, she was a beautiful virgin who turned away all suitors, declaring that she could have no spouse but Jesus. The rejected suitors informed Roman officials that she was a Christian, and she was punished by being exposed in a brothel. There she was left miraculously unharmed; the only man who attempted to violate her was struck blind, and she healed him with prayer. She was later murdered during the persecutions ordered by Diocletian.

Agnew, Spiro T(heodore) (b. Nov. 9, 1918, Baltimore, Md.,

U.S. — d. Sept. 17, 1996, Berlin, Md.) U.S. politician, the only vice president forced to resign. He studied law at the University of Baltimore and began a law practice in a Baltimore suburb in 1947. He was elected Baltimore county executive in 1962 and then governor of Maryland in 1967. In 1968 and 1972 he was elected vice president on the Republican ticket headed by Richard Nixon. His sometimes colourful denunciations of Vietnam War protesters and other opponents of the Nixon administration brought him much attention in the news media. Investigated for extortion, bribery, and income-tax violations allegedly committed during his governorship, he resigned the vice presidency in 1973 and pleaded no contest to a single income-tax charge. He was fined $10,000 and sentenced to three years of unsupervised probation. Disbarred in 1974, he became a consultant to foreign businesses.

Agni Hindu god of fire, second only to Indra in Vedic mythology. He is the fire of the sun, of lightning, and of the hearth of worship, and is the divine personification of the fire of sacrifice. He is thus the messenger between human and divine orders. Agni is described as ruddy-hued and with two faces, one beneficent and one malignant. In the Rig Veda he is sometimes identified with Rudra, the forerunner of Shiva.

Agnon \ag-'non\, S.Y. orig. Shmuel Yosef Halevi Czaczkes (b.

July 17, 1888, Buczacz, Galicia, Austria-Hungary — d. Feb. 17, 1970, Rehovot, Israel) Israeli writer. Bom into a Polish Galician family, Agnon settled in Palestine in 1907 and chose Hebrew as his literary language. The Day Before Yesterday (1945), perhaps his greatest novel, examines the problem facing the Westernized Jew who immigrates to Israel. Other works include the novels The Bridal Canopy (1919) and A Guest for the Night (1938). He is regarded as one of the greatest modem Hebrew novelists and short-story writers. In 1966 he and Nelly Sachs shared the Nobel Prize for Literature.

agnosticism Vag-'nas-to-.siz-omX Doctrine that one cannot know the existence of anything beyond the phenomena of experience. It is popularly equated with religious skepticism, and especially with the rejection of traditional Christian beliefs under the impact of modern scientific thought. T.H. Huxley popularized philosophical agnosticism after coining the term agnostic (as opposed to gnostic) in 1869, to designate one who repudiated traditional Judeo-Christian theism but was not a doctrinaire atheist (see atheism). Agnosticism may mean no more than the suspension of judgment on ultimate questions because of insufficient evidence, or it may constitute a rejection of traditional Christian tenets.

agora Va-go-roV In ancient Greek cities, an open space serving as an assembly area and backdrop for commercial, civic, social, and religious activities. Use of the agora varied in different periods. Located in the middle of the city or near the harbor, it was often enclosed by public buildings, colonnades containing shops, and stoas for protection from sun and bad weather. The highest honor for a citizen was to be granted a tomb in the agora. See photograph on following page.

Agoracritus or Agorakritos \,a-g3-'rak-r9-t3s\ (fl. 5th century bc) Greek sculptor. A student of Phidias, his most notable work was the colossal marble statue of Nemesis at Rhamnus. A fragment of the head is in the British Museum, and fragments of the pedestal reliefs are in Athens.

agouti \3-'gu-te\ Any of several species (genus Dasyprocta) of rabbit-

sized rodents that occur in the American tropics (southern Mexico to

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Plaster model of the Agora, Athens, as it might have appeared in the 2nd century AD

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northern South America). Agoutis are 16-24 in. (40-60 cm) long and have a long body, small ears, either a vestigial tail or none at all, and slender feet with long, hooflike claws. Their wiry fur is reddish brown to blackish, with individual hairs banded in what is called the agouti pattern. Agoutis generally live in forests and eat roots, leaves, and fruit.

Agra Ya-gra\ City (pop., 2001: 1,275,134), west-central Uttar Pradesh state, India. It was founded by Sikandar Lodi in the early 16th century on the Yamuna River southeast of Delhi and was intermittently the Mughal capital. The city fell successively to the Jats and the Marathas in the late 18th century and finally to the British in 1803. It is the site of the Taj Mahal and the imperial tomb of Akbar.

Agra monte \a-gra-'mon-ta\ (y Simoni), Aristides (b. June 3, 1868, Camagiiey, Cuba — d. Aug. 19, 1931, New Orleans, La., U.S.) Cuban-bom U.S. physician, pathologist, and bacteriologist. Reared in New York City, he received his M.D. from Columbia University. He was a member of the U.S. Army's Reed Yellow Fever Board, which discovered in 1901 the role of mosquitoes in transmitting yellow fever. As a professor at the University of Havana (1900-30), he became an influential leader of scientific medicine in Cuba.

Agri Dag i See Mount Ararat

agribusiness Agriculture operated by business; specifically, that part of a modem national economy devoted to the production, processing, and distribution of food and fibre products and byproducts. Commercial farming has largely supplanted the family farm in production of cash crops. Some food-processing firms that operate farms have begun to market fresh produce under their brand names. In recent years, conglomerates involved

in nonagricultural businesses have entered agribusiness by buying and operating large farms.

Agricola Xo-'gri-ko-loV Georgius orig. Georg Bauer (b. March 24, 1494, Clauchau, Saxony — d. Nov. 21, 1555, Chemnitz) German scholar and scientist known as the father of mineralogy. A town physician in Saxony (1527-33), he was among the first to found a natural science upon observation as opposed to speculation. His De re metallica (1556) dealt chiefly with mining and smelting; his De natura fossilium (1546), considered the first mineralogy textbook, presented the first scientific classification of minerals (based on their physical properties) and described many new minerals, their occurrence, and mutual relationships.

Agricola Ns-'grik-s-bV Gnaeus Julius (b. June 13, ad 40, Forum Julii, Gallia Narbonensis — d. Aug. 23, 93) Roman general. After Agricola served as tribune and quaestor in Britain and Asia, Vespasian appointed him governor of Britain (77/78-84). In that role he conquered parts of Wales and northern England, then advanced into Scotland and set a frontier between the Firths of Clyde and Forth. In 83 he crossed the Forth and defeated the Caledonians at Mons Graupius; he then occupied Scotland to the fringe of the Highlands, with forts at the main passes and a fortress

at Inchtuthil. Recalled to Rome, Agricola was offered the proconsulship of Asia but chose retirement. His life is known through the writings of his son-in-law Tacitus.

Agricultural Adjustment Administration (AAA) New Deal program to restore U.S. agricultural prosperity during the Great Depression. Established by an act of Congress in 1933, the AAA sought to curtail farm production of certain staples, in order to raise prices. It also established the Commodity Credit Corp., to make loans to farmers and to purchase and store crops in order to maintain farm prices. The program had limited success before it was declared unconstitutional in 1936.

Agricultural Revolution Gradual transformation of the traditional agricultural system that began in Britain in the 18th century. Aspects of this complex transformation, which was not completed until the 19th century, included the reallocation of land ownership to make farms more compact and an increased investment in technical improvements, such as new machinery, better drainage, scientific methods of breeding, and experimentation with new crops and systems of crop rotation. The agricultural revolution was an essential prelude to the Industrial Revolution.

agriculture Science or art of cultivating the soil, growing and harvesting crops, and raising livestock. Agriculture probably first developed in South Asia and Egypt, then spread to Europe, Africa, the rest of Asia, the islands of the central and South Pacific, and finally to North and South America. Agriculture in the Middle East is believed to date from 9000-7000 bc. Early cultivated crops include wild barley (Middle East), domesticated beans and water chestnuts (Thailand), and pumpkins (the Americas). Domestication of animals occurred during roughly the same period. Slash-and-burn land-clearing methods and crop rotation were early agricultural techniques. Steady improvements in tools and methods over the centuries increased agricultural output, as did mechanization, selective breeding and hybridization, and, in the 20th century, the use of herbicides and insecticides. More of the world’s aggregate manpower is devoted to agriculture than to all other occupations combined.

agrimony \ l a-gr3-,mo-ne\ Any plant of the genus Agrimonia, of the rose family, especially A. eupatoria. This species is a herbaceous, hardy perennial native to Europe but widespread in other northern temperate regions, where it grows in hedge banks and the borders of fields. Its leaves yield a yellow dye. The leaflets are oval with toothed margins; the small, stalkless yellow flowers are borne in a long terminal spike. The fruit is a tiny burr. A. gryposepala, a similar species, is widespread in the U.S.

Agrippa b-'grip-sV Marcus Vipsanius (b. 63 bc? — d. March, 12 bc, Campania) Powerful deputy of Augustus. He helped Octavian (later Augustus) take power after Julius Caesar's murder (44 bc), defeating Sextus Pompeius in 36 and Mark Antony at the Battle of Actium in 31. He went on to quell rebellions, found colonies, administer parts of the empire, and give to Rome funds for public works and buildings. In 23 Augustus seemed to make him heir, and Agrippa married Augustus's daughter, Julia. His administrative and military skills were particularly directed to the eastern empire, where in 15 he met with and made an ally of Herod of Judaea. Agrippa' s writings (now lost) influenced Strabo and Puny the Elder. His daughter Agrippina the Elder (14? bc-ad 33) was the wife of Germanicus Caesar, mother of Caligula and Agrippina the Younger, and grandmother of Nero.

Agrippina X.ag-ri-'pI-naV the Younger (b. ad 15 — d. 59) Mother of Nero and a major influence in the early years of his reign. Daughter of Agrippina the Elder (c. 14 bc-ad 33) and sister of Caugula, she was exiled (39—41) for conspiring against Caligula. Her first husband, Gnaeus Domitius Ahenobarbus, was Nero's father. Accused of poisoning her second husband (49), she married Claudius, her uncle, and had him adopt Nero

Agouti (Dasyprocta).

WARREN GARST/TOM STACK & ASSOCIATES

Marcus Vipsanius Agrippa, marble portrait bust, early 1 st century bc; in the Louvre, Paris.

CLICHE MUSEES NATIONAUX, PARIS

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as his heir instead of his own son. She poisoned her son's rivals, and when Claudius died in 54 she was suspected of having poisoned him. She became regent when Nero took the throne at age 16, but she gradually lost power. He tried to murder her when she opposed one of his affairs, and he finally had her put to death at her country house.

agrochemical Any chemical used in agriculture, including chemical fertilizers, herbicides, and INSECTICIDES. Most are mixtures of two or more chemicals; active ingredients provide the desired effects, and inert ingredients stabilize or preserve the active ingredients or aid in application. Together with other technological advances, including tractors, mechanical harvesters, and irrigation pumps, agrochemicals have increased the per-acre productivity of regions such as the Great Plains by 200-300% since the 1930s. Their long-term effects on the environment and the stability of agricultural systems that use them are hotly debated.

agronomy Branch of agriculture that deals with field crop production and soil management. Agronomists generally work with crops that are grown on a large scale (e.g., small grains) and that require relatively little management. Agronomic experiments focus on a variety of factors relating to crop plants, including yield, diseases, cultivation, and sensitivity to factors such as climate and soil.

Aguan \a-'gwan\ River River, northern Honduras. It rises in the central highlands west of Yoro, descends northeast to the coastal lowlands for a distance of 150 mi (240 km), and empties into the Caribbean Sea near Santa Rosa de Aguan. The lands along the river are used primarily for agriculture but are susceptible to floods and hurricanes.

Aguascalientes \,a-gwas-kal-'yen-tas\ State (pop., 2000: 944,285), central Mexico. With an area of 2,112 sq mi (5,471 sq km), it is one of the country's smallest states. It occupies part of the central plateau. It was explored by Spaniards in the 16th century and became a colonial mining centre. During the revolution of 1910-20 it was the scene of bitter fighting. Today it is a fertile agricultural area and is noted for its mineral production. Its capital is the city of Aguascalientes.

Aguascalientes City (pop., 2000: 594,056), capital of Aguascalientes state, Mexico. Located on the Aguascalientes River, it was founded as a mining settlement in 1575 and became the state capital in the 1850s. It is sometimes called La Ciudad Perforada ("The Perforated City") because of an underground labyrinth of tunnels built by an unknown pre-Columbian people. It is an agricultural centre, with several industries. Several notable churches possess outstanding examples of colonial religious art.

Aguinaldo V.a-ge-'nal-doV Emilio (b. March 23, 1869, near Cavite, Luzon, Phil. — d. Feb. 6, 1964,

Manila) Philippine independence leader. He was born of Chinese and Tagalog parentage and was educated at the University of Santo Tomas,

Manila. He became a leader of the Katipunan, a revolutionary society that fought the Spanish. Philippine independence was declared in 1898, and Aguinaldo became president, but within months Spain signed a treaty ceding the islands to the U.S. Aguinaldo fought U.S. forces until he was captured in 1 90 1 . After taking an oath of allegiance to the U.S., he was induced to retire from public life. He collaborated with the Japanese during World War II. After the war he was briefly imprisoned; released by presidential amnesty, he was vindicated by his appointment to the Council of State in 1950. In his later years he promoted nationalism, democracy, and improvement of relations between the U.S. and the Philippines.

Agulhas Nd-'gdl-dsX, Cape Cape, southernmost point of the African continent. Its name, Portuguese for “needles,” refers to the rocks and reefs that have wrecked many ships. The cape’s meridian of 20°E is the official boundary between the Indian and Atlantic oceans.

Agusan River \3-'gu-,san\ River, Mindanao, Philippines. Rising in the southeast and flowing north 240 mi (390 km) to enter Butuan Bay of the Bohol Sea, it forms a fertile valley 40-50 mi (65-80 km) wide between the Central Mindanao Highlands and the Pacific Cordillera. It is navigable

for 160 mi (260 km). Despite early Spanish contacts in the 17th century, most of the valley has remained sparsely settled by native peoples.

Ahab Ya- ,hab\ (fl. 9th century bc) Seventh king of the northern kingdom of Israel (r. c. 874-853 bc). He inherited a realm that included territory east of the Jordan River, in Gilead and probably Bashan, and also the tributary kingdom of Moab. His marriage to Jezebel revived an alliance with the Phoenicians, but her efforts to establish Baal worship provoked bitter opposition from Elijah. Ahab’s reign was dominated by a fierce border war with Syria; he died in an attempt to recover Ramoth-Gilead from the Syrians.

Ahaggar Vo-'ha-gor, ,a-h9-'gar\ or Hoggar Vhag-or, o-'gar\ Mountains High plateau region, southern Algeria. Located in the central Sahara, it extends about 970 mi (1,550 km) from north to south and 1,300 mi (2,100 km) from east to west. Its mean elevation is above 3,000 ft (900 m); its highest peak is Mount Tahat (9,573 ft [2,918 m]). The main caravan route to Kano (Nigeria) passes along its western margin.

Ahidjo Xa-'hi-joV, Ahmadou (b. August 1924, Garoua, Cameroon — d. Nov. 30, 1989, Dakar, Senegal) First president of Cameroon, 1960-82. He presided over one of the few successful attempts at African unity: the joining of the southern half of the former British Cameroons with the

larger French-speaking Cameroun. In 1982, after managing to build up a stable, relatively prosperous nation (through single-party rule), he went into exile after being implicated in a plot against his successor, Paul Biya.

ahimsa \o-'him-sa\ (Sanskrit: “noninjury”) Fundamental ethical virtue of Jainism, also respected in Buddhism and Hinduism. In Jainism ahimsa is the standard by which all actions are judged. It requires a householder observing the small vows (anuvrata) to refrain from killing any animal life. An ascetic observing the great vows (mahavrata) is expected to take the greatest care not to injure any living substance, even unknowingly. To do so interrupts that being’s spiritual progress and increases one’s own karma, delaying liberation from the cycle of rebirth. In the 20th century Mohandas K. Gandhi extended ahimsa into the political sphere as satyagraha.

Ahmad, MTrza Ghulam See Mlrza Ghulam Ahmad

Ahmad ibn Hanbal Vak-mod-.ib-sn-'kan-bolV (b. 780, Baghdad, Iraq — d. 855, Baghdad) Muslim theologian and jurist. He began to study the Hadith (Traditions) at age 15. He traveled widely to study with the great masters and made five pilgrimages to Mecca. In 833-835 he bravely endured floggings and imprisonment rather than subscribe to the Mu'tazilI doctrine of a created (rather than eternal) Qur’an, and he is remembered as a staunch upholder of Muslim traditionalism. He compiled the Traditions of Muhammad and is the eponym of the Hanbal! school, the most traditional of the four orthodox Islamic schools of law. Opposing codification of the law, he believed jurists needed the freedom to derive legal solutions from the Qur’an and the sunna. He is revered as one of the fathers of Islam.

Ahmad Khan Vam-ad-'kanV, Sir Sayyid (b. Oct. 17, 1817, Delhi — d. March 27, 1898, Aligarh, India) Indian educator and jurist. Born into a family of officials in the Mughal dynasty, he worked for the British East India Co. and held various judicial posts. He supported the British in the 1857 Indian Mutiny but criticized their errors in his influential pamphlet Causes of the Indian Revolt. His other works include Essays on the Life of Mohammed (1870) and commentaries on the Bible and Qur’an. He founded schools at Muradabad and Ghazipur, established the Scientific Society, sought to strengthen the Muslim community through the reform journal Tahdhib al-Akhlaq, and was active in founding a Muslim college, the Anglo-Mohammedan Oriental College, in 1877 at Aligarh.

Ahmad Shah Durrani Vak-mod-'sha-dur-'a-neN (b. c. 1722, Multan, Punjab — d. Oct. 16?, 1772, Toba Ma'ruf, Afg.) Founder of modern Afghanistan. The son of an Afghan chief, he became shah in 1747 on the death of the Persian conqueror Nadir Shah, in whose army he had served. He proceeded to invade India nine times over the next 22 years in an attempt to control the trade routes between northern India and central and western Asia and became ruler of an empire that extended from the Amu Darya to the Indian Ocean and from Khorasan to present-day northern India. His hold on the Punjab, governed by his son Timur Shah, was weakened by rebellions at home, and he ultimately lost control of it to the Sikhs. Much of his empire disintegrated after his death.

Ahmad Sirhindi \sir-'hin-de\ (b. 1564?, Sirhind, Patiala, India — d. 1624, Sirhind) Indian mystic and theologian who is responsible for the

Emilio Aguinaldo.

BROWN BROTHERS

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revival of Sunnite Islam in India. He traced his descent from ‘Umar ibn al-Khatjab. After a traditional Muslim education, he joined an important Sufi order and devoted himself to preaching against the tendencies of Akbar and his successor, Jahangir, toward pantheism and ShT'ite Islam. His views are outlined in his most famous work, Maktubat, a compilation of his letters. His burial place at Sirhind is a site of pilgrimage.

Ahmadiyyah X.ah-mo-'de-oX Islamic sect, founded in India in 1889 by MIrza Ghulam Ahmad. It holds that Jesus feigned death and resurrection and escaped to India and that jihad is a peaceful battle against nonbelievers. Following the death of Ghulam Ahmad’s successor (1914), the Ahmadiyyah split. The Qadiani, based in Rabwah, Pak., recognize Ghulam Ahmad as a prophet; they are zealous missionaries, preaching Ahmadi beliefs as the one true Islam. A Lahore-based sect regards Ghulam Ahmad merely as a reformer and seeks to make converts to Islam generally. The term Ahmadiyyah is also used to describe various Sufi orders (see Sufism), particularly that founded by Ahmad al-Badaw! (d. 1276). One of the most popular orders in Egypt, it has branches throughout the Islamic world.

Ahmadu Seku Xa-'mad-ii-'sa-kuX (d. 1898, Sokoto, Northern Nigeria) Second and last ruler of the Tukulor empire in West Africa. Succeeding his father, al-Hajj ‘Umar, in 1864, Ahmadu ruled over a great empire centred on the ancient Bambara kingdom of Segu, in present Mali. In 1887 he was forced to abandon Segu and accept French protectorate status. By 1891 most of his strongholds had been seized.

Ahmed Yesevi Xak-'met-.ye-se-'veX or Ahmad Yasawi

Xak-'med-.ya-sa-'veX (b. 11th century, Sayram — d. 1166, Yasi, Turkistan) Turkish poet and Sufi mystic. When he was young his family moved to Yasi, where he began his teaching. The Book of Wisdom, a collection of mystical poetry, is traditionally attributed to him. He established a mystical order whose rituals preserved Islamic and ancient Turco-Mongol customs, and promoted the spread of mysticism throughout the Turkish-speaking world. His poetry influenced Turkish literature and led to the development of mystical folk literature. He was revered as a saint, and Timur erected a magnificent mausoleum over his grave in 1397/98.

Ahmedabad Va-mo-do-.badX or Ahmadabad City (pop., 2001: metro, area, 4,525,013), Gujarat state, west-central India. It is located on the Sabarmati River 275 mi (440 km) north of Mumbai (Bombay). Founded in 1411 by Sultan Ahmad Shah, Ahmedabad reached its height later that century but subsequently declined. It was revived under Mughal emperors in the 17th century and came under British rule in 1818. With the opening of cotton mills in the mid- 19th century, it became India’s largest

inland industrial centre. The city is associated with Indian nationalism; Mohandas K. Gandhi’s political agitation began there in 1930. In 2001 the city was struck by a violent earthquake that took many lives.

Alisa*? \ak-'sa-e\, Ahmad al- in full Shaykh Ahmad ibn Zayn al-DTn Ibrahim al-Ahsa’I (b. 1753, Al-Hasa, Arabia — d. 1826, near Medina) Founder of the heterodox ShTite Muslim Shaykh! sect of Iran. He traveled widely in Persia and the Middle East. In 1808 he settled in Yazd, Persia, where he attracted followers with his interpretation of ShTism. He claimed knowledge from visions of Muhammad and the imams and contended that the imams were originally beings of divine light who participated in the creation of the world. Orthodox ShTite theologians declared him an apostate in 1824; he died two years later on pilgrimage to Mecca, but the Shaykh! sect survived him.

Ahura Mazda Va-hur-o-'maz-doX Supreme god of ancient Iranian religion, especially Zoroastrianism. Ahura Mazda was worshiped by Darius I and his successors as the greatest god and the protector of the just king. Zoroaster taught that Ahura Mazda created the universe and maintains the cosmic order, and that the history of the world consists of the battle between two spirits he created — the beneficent Spenta Mainyu and the destructive Angra Mainyu. The Avesta identifies Ahura Mazda himself with the beneficent spirit and represents him as bountiful, all-knowing, and the creator of everything good. In late sources (from the 3rd century), Zurvan (“Time”) is the father of the twins Ormazd (Ahura Mazda) and Ahriman (Angra Mainyu), who in orthodox Mazdaism (Zoroastrianism and Parsiism) reign alternately over the world until Ormazd’ s ultimate victory.

Ai \'a-,I\ Town, eastern Canaan, ancient Palestine. In the Bible (Joshua 7-8), it was destroyed by the Israelites under Joshua. Biblical references agree in locating Ai just east of Bethel (modern Bay tin) in the West Bank, at the Early Bronze Age site now called Al-Tall. Excavations at Ai in 1933-35 uncovered a temple of the 3rd millennium bc. The biblical events at Ai are assigned to the period c. 1400-1200 bc, when evidence indicates it was not in fact occupied; early tradition may have identified the Canaanite town under Bethel with the nearby ruins of Al-Tall.

Aidan Vad-YA, Saint (b. Ireland — d. Aug. 31, 651, Bamburgh, Northumberland, Eng.; feast day August 31) Apostle of Northumbria and founder of Lindisfarne. He was a monk at Iona in Scotland when King Oswald of Northumbria requested that he be made bishop of the newly converted Northumbrians. He established his church, see, and monastery on the island of Lindisfarne, not far from the royal stronghold of Bamburgh. From there he evangelized northern England, founding churches, monasteries, and a school. Bede praised him for his learning, charity, and simplicity of life.

aide-de-camp \,ad-di-'kamp\ Officer on the personal staff of a general, admiral, or other high-ranking commander who acts as a confidential secretary. Today they are usually of junior rank, and their duties are largely social. The term also denotes a high-ranking military officer who acts as an aide to a chief of state.

AIDS in full acquired immunodeficiency syndrome Transmissible disease of the immune system caused by HIV. AIDS is the last stage

of HIV infection, during which time the individual develops frequently fatal infections and cancers, including Pneumocystis carinii pneumonia, cytomegalovirus (C MV), lymphoma, and Kaposi sarcoma. The first AIDS cases were identified in 1981, HIV was isolated in 1983, and blood tests were developed by 1985. According to the UN's 2004 report on AIDS, some 38 million people are living with HIV, approximately 5 million people become infected annually, and about 3 million people die each year from AIDS. Some 20 million people have died of the disease since 1981. Sub-Saharan Africa accounts for some 70 percent of all HIV infections. Rates of infection are lower in other parts of the world, but the epidemic is spreading rapidly in eastern Europe, India, South and Southeast Asia, Latin America, and the Caribbean.

Aiken Va-konX, Conrad (Potter) (b. Aug. 5, 1889, Savannah, Ga., U.S. — d. Aug. 17, 1973, Savannah) U.S. writer. Aiken was traumatized as a child when his father killed Aiken's mother and then himself. Educated at Harvard University, Aiken wrote most of his fiction in the 1920s and '30s. His works are influenced by early psychoanalytic theory. Generally more successful than his novels were his short stories, notably "Strange Moonlight" from Bring! Bring! (1925) and "Silent Snow, Secret Snow" and "Mr. Arcularis" from Among the Lost People (1934). His best poetry, including "Preludes to Definition," is in his Collected Poems (1953).

Aiken, Howard H(athaway) (b. March 9, 1900, Hoboken, N.J., U.S. — d. March 14, 1973, St. Louis, Mo.) U.S. mathematician and inventor. He received his Ph.D. from Harvard University. With three other engineers, he began work in 1939 on an automatic calculating machine that could perform any selected sequence of five arithmetical operations (addition, subtraction, multiplication, division, and reference to previous results) without human intervention. The first such machine, the Harvard Mark I (1944), was 51 ft (15 m) long and 8 ft (2.4 m) high, and weighed 35 tons (31,500 kg).

aikido X.I-ki-'do, i-'ke-do\ Japanese art of self-defense. It employs locks and holds and utilizes the principle of nonresistance to cause an opponent's own momentum to work against him or her. Aikido emphasizes the importance of achieving complete mental calm and control of one's own body to master an opponent's attack. There are no offensive moves. It traces its origins to Japanese martial (samurai) traditions dating to the 14th century, and it was developed as a modem form in the early 20th century by Ueshiba Morihei. See martial art.

ailanthus Xa-'lan-thosX Any of the flowering plants that make up the genus Ailanthus, in the quassia family (Simaroubaceae), native to eastern and southern Asia and northern Australia and naturalized in subtropical and temperate regions elsewhere. Ailanthus leaves alternate along the stem and are composed of multiple leaflets arranged along an axis. The most familiar species is the tree of heaven.

Ailey Va-le\, Alvin, Jr, (b. Jan. 5, 1931, Rogers, Texas, U.S. — d. Dec. 1, 1989, New York, N.Y.) U.S. dancer and choreographer. In 1942 he moved to Los Angeles, where he studied dance and choreography (1949-54). He then moved to New York, where he performed in various theatrical productions. In 1958 he founded the Alvin Ailey American Dance Theater, composed primarily of blacks. The numerous works he choreo-

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graphed for the company included its signature Revelations (1960), set to black spirituals. From the 1960s to the 1980s, the company toured worldwide, and Ailey became one of the best-known U.S. choreographers.

Ailly \a-'ye\/ Pierre d' (b. 1350,

Compiegne, Fr. — d. Aug. 9, 1420,

Avignon) French theologian and cardinal. D' Ailly worked to end the Western Schism. He advocated the doctrine of conciliarism (see Conciliar Movement), which maintained that supreme authority in the church was held by a general council. He was active at the Council of Pisa (1409), which deposed both pope and antipope in favour of the new conciliar pope, Alexander V, but failed to end the schism. He was also involved in the Council of Constance (1414-18), which called for the abdication of the antipope John XXIII (r. 1410-15) and the election of another pope (Martin V) and ended the schism. His writings included a geographical treatise. Image of the World , used by Christopher Columbus.

Aintab See Gaziantep

Ainu Vl-nii\ Indigenous people of what is now Japan. Pushed north by the Japanese people over the last 2,000 years, the few remaining pure Ainu today live principally in northern Hokkaido, Sakhalin, and the Kuril Islands. Once physically and culturally distinct from the Japanese, their origins and their role in Japanese history and prehistory have been the subject of scholarly debate. Many contemporary Ainu claim some connection to the prehistoric Jomon culture. The Ainu language, which has no known relationship to any other language, is virtually extinct, being supplanted by Japanese. The Ainu were traditionally hunters, fishermen, and trappers; their religion centred on spirits believed to be present in animals and the natural world.

air Mixture of gases constituting the earth’s atmosphere. Some gases occur in steady concentrations. The most important are molecular nitrogen (N_2), 78% by volume, and molecular oxygen (O_2), 21%. Small amounts of argon (Ar; 1.9%), neon (Ne), helium (He), methane (CH_4), krypton (Kr), hydrogen (H_2), nitrous oxide (N_2O), and xenon (Xe) are also present in almost constant proportions. Other gases occur in variable concentrations: water vapour (H_2O), ozone (O_3), carbon dioxide (CO_2), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2). Air also contains trace amounts of ammonia and hydrogen sulfide. The variable constituents are important for maintaining life. Water vapour is the source for all forms of precipitation and is an important absorber and emitter of infrared radiation. Carbon dioxide is necessary for photosynthesis and is also an important absorber and emitter of infrared radiation. Ozone in the stratosphere (see ozone layer) is an effective absorber of ultraviolet radiation from the Sun but at ground-level is a corrosive pollutant and a major constituent of smog.

air brake Either of two kinds of braking systems. The first, used by trains, trucks, and buses, operates by a piston driven by compressed air from reservoirs connected to brake cylinders (see piston and cylinder). When air pressure in the brake pipe is reduced, air is automatically admitted into the brake cylinder. The first practical air brake for railroads was invented in the 1860s by George Westinghouse. The second type, used by aircraft and race cars, consists of a flap or surface that can be mechanically projected into the airstream to increase the resistance of the vehicle to air and lower its speed.

air-conditioning Control of temperature, humidity, purity, and motion of air in an enclosed space, independent of outside conditions. In a self-contained air-conditioning unit, air is heated in a boiler unit or cooled by being blown across a refrigerant-filled coil and then distributed to a controlled indoor environment. Central air-conditioning in a large building generally consists of a main plant located on the roof or mechanical floor and intermittently spaced air-handling units, or fans that deliver air through ducts to zones within the building. The air then returns to the central air-conditioning machinery through spaces called plenums to be recooled (or reheated) and recirculated. Alternate systems of cooling use chilled water, with water cooled by a refrigerant at a central location and circulated by pumps to units with fans that circulate air locally.

air-cushion vehicle or hovercraft Vehicle supported above the surface of land or water by an air cushion, produced by downwardly directed fans, enclosed within a flexible skirt beneath the hull. The concept was first proposed by John Thornycroft in the 1870s, but a working model was not produced until 1955, when Christopher Cockerell solved the problem of keeping the air cushion from escaping from under the vehicle, and formed Hovercraft Ltd. to manufacture prototypes. Problems with skirt design and engine maintenance have restricted the vehicle’s commercial application; today hovercraft are used mainly as ferries.

air force Military organization that has the primary responsibility for conducting air warfare. The air force must gain control of the air, support ground forces (e.g., by attacking enemy ground forces), and accomplish strategic-bombing objectives. Its basic weapons platforms are fighters, bombers, attack aircraft, and early warning and control aircraft. Since the

mid-20th century, some air forces have also been responsible for land-based nuclear missiles as well as nuclear- armed bombers. The army and naval branches of a state’s armed forces may also operate aircraft.

Air France in full Compagnie Internationale Air France

French passenger and cargo airline with more than 200 destinations in some 80 countries. It introduced supersonic Concorde service in 1976, but financial loss led the company to cease its Concorde operations in 2003. The French government began privatizing the former national airline in July 2002. In 2004 Air France acquired the Dutch airline KLM to create Air France-KLM, one of the largest air carriers in the world. The two airlines, however, continued to operate as separate companies, retaining their own hubs, flights, and logos.

air mass In meteorology, a large body of air having nearly uniform conditions of temperature and humidity at any given altitude. Such a mass has distinct boundaries and may extend hundreds or thousands of miles horizontally and sometimes as high as the top of the troposphere. An air mass forms whenever the atmosphere remains in contact with a large, relatively uniform land or sea surface long enough to acquire its temperature and moisture properties. The Earth’s major air masses all originate in polar or subtropical latitudes. The middle latitudes constitute essentially a zone of modification, interaction, and mixing of the polar and tropical air masses.

air pollution Release into the atmosphere of gases, finely divided solids, or finely dispersed liquid aerosols at rates that exceed the capacity of the atmosphere to dissipate them or to dispose of them through incorporation into the biosphere. Dust storms in desert areas and smoke from forest and grass fires contribute to particulate and chemical air pollution. Volcanic activity is the major natural source of air pollution, pouring huge amounts of ash and toxic fumes into the atmosphere. Air pollution may affect humans directly, causing irritation of the eyes or coughing. More indirectly, its effects can be measured far from the source, as, for example, the fallout of tetraethyl lead from automobile exhausts, which has been observed in the oceans and on the Greenland ice sheet. Still less direct are possible effects on global climates. See also smog.

air warfare Military operations conducted by airplanes, helicopters, or other aircraft against aircraft or targets on the ground and in the water. Air warfare did not become important until World War I (1914-18). The British, French, German, Russian, and Italian armed forces had flying units, including biplanes armed with machine guns for “dogfights” with enemy fighter aircraft. Zeppelins and larger airplanes carried out bombing raids. The 1920s and ’30s saw the development of the monoplane, the all-metal fuselage, and the aircraft carrier. During World War II (1939–45), the Battle of Britain was the first fought exclusively in the air, the Battle of the Coral Sea was the first between carrier-based aircraft, and the atomic bombings of Hiroshima and Nagasaki were the first use of

Alvin Ailey, Jr., 1 960.

COURTESY OF ZACHARY FREYMAN

Ainu couple in ceremonial dress, Hokkaido, Japan.

COURTESY OF THE CONSULATE GENERAL OF JAPAN, NEW YORK CITY

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nuclear-armed bombers. In the jet age, air power has continued to be used in strategic bombing of an enemy's home territory (as in the Vietnam War, 1965-74), destroying enemy air forces (as in the Arab-Israeli wars), attacking and defending carrier-based naval fleets (as in the Falkland Islands War, 1982), and supporting ground forces (as in the Persian Gulf War, 1990-91).

airbrush Pneumatic device for developing a fine, small-diameter spray of paint, protective coating, or liquid colour (see aerosol). The airbrush can be a pencil-shaped atomizer used for various highly detailed activities such as shading drawings and retouching photographs; in contrast, a spray gun is usually used for covering large surfaces with paint.

Airbus S.A.S. European aircraft manufacturer that is the world's second largest maker of commercial aircraft (after Boeing Co.). It is co-owned by the German-French-Spanish European Aeronautic Defence and Space Company (EADS), with an 80% interest, and Britain's BAE Systems, with 20%. Airbus was formed as a consortium in 1970 by French and German aerospace firms (later joined by Spanish and British companies) to fill a market niche for short- to medium-range, high-capacity jetliners and to compete with long-established American manufacturers. Its first product, the A300, entered service in 1974. It was the first wide-body jetliner equipped with only two engines for more economical operation. The twin-engine A320 (entered service 1988) incorporated numerous technical innovations, notably fly-by-wire (electric rather than mechanically linked), computer-based flight controls. The four-engine A340 (1993) and smaller, twin-engine A3 30 (1994) were long-range airliners. In 2000 Airbus launched development of the A380, intended to be the world's largest passenger jet with a typical seating of 555 people. The consortium integrated into a single company in 2001.

aircraft carrier Naval vessel equipped with a platform that allows airplanes to take off and land. Takeoffs are facilitated by the use of catapults or by a ramp at the end of the flight deck. For landing, aircraft are fitted with retractable hooks that engage arresting wires on the deck, or they are built with vectored-thrust engines that allow them to be landed vertically. Britain's Royal Navy developed the first true aircraft carrier near the end of World War I, and carriers played leading roles in World War II naval engagements such as the Pearl Harbor attack and the Battles of Midway and the Coral Sea. The largest modern carriers are 1,000-ft (300-m) nuclear-powered vessels of the U.S. Navy, which can carry 100 jet air-

craft. Other types include the light carrier, equipped for anti-submarine warfare and ground attack, and the helicopter carrier, intended for conducting amphibious assault.

Airedale terrier Dog breed that is the largest of the terriers, probably descended from the otterhound and the extinct Old English terrier. It stands about 23 in. (58 cm) high, weighs 40-50 lbs (1 8-23 kg), and has a boxy appearance, with a long, squared muzzle. Its coat is dense and wiry, with a black saddle and tan legs, muzzle, and underparts. Intelligent and courageous, powerful and affectionate (though reserved with strangers), the Airedale has been used as a wartime dispatch carrier, police dog, guard, and big-game hunter.

airfoil Shaped surface, such as an airplane wing, tail, or propeller blade, that produces lift and drag when moved through the air. An airfoil produces a lifting force that acts at right angles to the airstream and a dragging force that acts in the same direction as the airstream. High-speed aircraft usually employ thin, low-drag, low-lift airfoils; slow aircraft that carry heavy loads use thicker airfoils with high drag and high lift.

airplane Fixed-wing aircraft that is heavier than air, propelled by a screw propeller or a high-velocity jet, and supported by the dynamic reaction of the air against its wings. An airplane’s essential components are the body or fuselage, a flight-sustaining wing system, stabilizing tail surfaces, altitude-control devices such as rudders, a thrust-providing power source, and a landing support system. Beginning in the 1840s, several British and French inventors produced designs for engine-powered aircraft, but the first powered, sustained, and controlled flight was only achieved by Wilbur and Orville Wright in 1903. Later airplane design was

affected by the development of the jet engine; most airplanes today have a long nose section, swept-back wings with jet engines placed behind the plane’s midsection, and a tail stabilizing section. Most airplanes are designed to operate from land; seaplanes are adapted to touch down on water, and carrier-based planes are modified for high-speed short takeoff and landing. See also airfoil; aviation; glider; helicopter.

fan air fuel fan

wing

Two physical forces essential to airplane flight are thrust and lift. Jet engines, such as the turbofan shown, provide forward thrust by taking in air through the front of the engine, compressing it, and burning it with fuel in the combustor. Hot exhaust gases and air are then expelled at high speed from the rear of the engine. Lift is generated by the flow of air past the wings. Air flowing over the rounded upper

surface of a wing moves faster than air flowing past the flat lower surface; as a result, the air above the wing exerts a lower pressure than the air below, producing a net upward force, or lift. Both lift and drag (friction caused by the plane moving through air) can be adjusted by the movement of ailerons, landing flaps, and tabs on the wings' edges. At the rear of the plane, the elevator, located on the horizontal stabilizer, controls the airplane's movement around the lateral axis. Both the elevator and the rudder, located on the vertical stabilizer, help to control turning movements initiated by the ailerons.

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airport Site and installations for the takeoff and landing of aircraft. Early airports were open, grass-covered fields, called landing fields, that allowed a pilot to head directly into the wind to aid a plane’s lift on take-off and to decrease its speed on landing. In the 1930s heavier airplanes required paved runway surfaces. Larger planes needed longer runways, which today can reach 15,000 ft (4,500 m) to accommodate the largest jet aircraft. Air traffic is regulated from control towers and regional centres. Passenger and cargo terminals include baggage-movement and passenger-transit operations.

airship or dirigible Lighter-than-air aircraft with steering and propulsion systems. Airships could be nonrigid (blimps), semirigid, or rigid.

the largest of the terriers, probably

Airedale terrier

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They all included a large cigar-shaped bag or balloon filled with a gas such as hydrogen or helium, a car or gondola suspended below the balloon that held the crew and passengers, engines to drive the propellers, and rudders for steering. Attempts to control the flight of balloons began soon after their invention in the 1780s. The first propeller-driven airship, built by Henri Giffard, flew in 1852 in France; design improvements led to construction of the rigid zeppelin (1900). The nonrigid helium-filled blimp was principally developed by Alberto Santos-Dumont (1873-1932). In 1928 Germany began regular transatlantic airship passenger service. Several explosions, particularly the 1937 Hindenburg disaster, and airplane developments made the airship commercially obsolete. See also balloon.

‘A’ishah \'a-esho\ (bint AbT Baler) (b. 614, Mecca, Arabia — d. July 678, Medina) Third wife of Muhammad. The daughter of his supporter Abu Bakr, she became Muhammad’s favourite wife. Left a childless widow at 18, she became politically active during the reign of the third caliph, ‘Uthman ibn ‘Affan, leading the opposition that resulted in his murder in 656. She led an army against his successor, 'All, who defeated her in the Battle of the Camel. She was allowed to live her remaining years quietly in Medina and is credited with transmitting more than a thousand HadIth.

Aitken, William Maxwell See Baron Beaverbrook

Aix-en-Provence \,eks-a n -pro-'va n s\ City (pop., 1999: 134,222), southeastern France. Founded as a military colony by the Romans c. 123 bc, it was the scene of the defeat of the Teutons by Marius in 102 bc. Visigoths, Franks, Lombards, and finally Muslim invaders from Spain successively plundered the town. As the capital of Provence, it was a centre of culture during the Middle Ages; it became part of France in 1486. It is now a residential suburb of Marseille; its industries include tourism, food processing, and the manufacturing of electrical machinery.

Aix-la-Chapelle See Aachen

Aix-la-Chapelle \,eks-la-sha-'pel\, Congress of (Oct. 1-Nov. 15, 1818) First of four congresses held by Britain, Austria, Prussia, Russia, and France to address European problems following the Napoleonic Wars. At Aix-la-Chapelle (now Aachen, Ger.), the participants accepted an offer by France to pay most of the war indemnity owed to the allies in exchange for the withdrawal of their armies of occupation. France was also admitted to the new Quintuple Alliance.

Aix-la-Chapelle, Treaty of (Oct. 18, 1748) Treaty that ended the War of the Austrian Succession. The treaty, negotiated largely by Britain and France, was marked by the mutual restitution of conquests, including the fortress of Louisbourg (in Nova Scotia) to France and Madras (now Chennai; in India) to England. It preserved Maria Theresa’s right to the Austrian lands, but the Habsburgs were weakened by Prussia’s retention of Silesia. The treaty did not resolve any issues in the commercial colonial struggle between England and France and thus did not lead to a lasting peace.

Aizawl \I-'zaul\ City (pop., 2001 prelim.: 229,714), capital of Mizoram state, India. It is situated on a ridge at an elevation of about 2,950 ft (900 m) The surrounding region is part of the Assam-Myanmar geologic province, with steeply inclined hill ranges. Many in the population are from Myanmar. In the 1970s Aizawl was the scene of an armed attack on the government treasury by members of the Mizo National Front. Manufactures include aluminum utensils, handloom textiles, and furniture.

Ajax Greek hero of the Trojan War. In the Iliad Homer described him as of great stature and second only to Achilles in strength and bravery. He fought Hector in single combat and rescued the body of Achilles from the hands of the Trojans. When Achilles’s armour was awarded to Odysseus, he was so enraged that he went mad. According to several Greek and Roman poets, Ajax slaughtered a flock of sheep he mistook for his enemies, then returned to his senses and killed himself out of shame.

Ajodhya See Ayodhya

AK \'a-'ka\ -47 Soviet assault rifle. Designed by Mikhail T. Kalashnikov (its name stands for “automatic Kalashnikov 1947”), it had both semiautomatic and automatic capabilities and fired intermediate-power 7.62-mm ammunition. It was manufactured in the former Soviet Union and Soviet-bloc countries and soon became the basic shoulder weapon for virtually all communist armies as well as for many guerrilla and nationalist movements. In the Soviet military it was replaced in the 1960s by the AKM, which featured a lighter, cheaper stamped-metal receiver, and in the 1970s by the AK-74, which fired a high-velocity 5.45-mm round. See also Ml 6 rifle.

Aka I Takht Vo-'kal-'tok-toX Chief centre of religious authority for Indian Sikhs, located in Amritsar opposite the Golden Temple. It also serves as the headquarters of the Akali Party. Since the line of Gurus came to an end in 1708, the Sikh community has settled religious and political disputes at meetings in front of the Akal Takht. In the 20th century local congregations began to pass resolutions on matters of Sikh doctrine and rules of conduct; disputed resolutions may be appealed to the Akal Takht. It was badly damaged during the assault on the Golden Temple by the Indian army in 1984 and had to be rebuilt. See also Sikhism.

Akali Parly \3-'ka-le\ Sikh political party in India. The term Akali was first applied to suicide squads that appeared in the Sikh armies c. 1690 in response to Mughal persecution. The Akali name was revived in the 1920s during the gurdwara reform movement to refer to a semimilitary corps of volunteers opposed to British rule. Akalis took the lead in agitation for a Punjabi-speaking Sikh-majority state, a goal achieved in 1966 with the establishment of the Indian state of Punjab. The modem Akali Party participates in national elections but is mainly concerned with the status of the Sikhs in Punjab.

Akan \'a-,kan\ Cluster of peoples inhabiting southern Ghana, eastern Cote d’Ivoire, and parts of Togo. Their languages are of the Kwa branch of Niger-Congo languages. In the 14th— 1 8th centuries several Akan states, notably the Fante confederacy and the Asante empire, formed in regions where gold was produced and traded. Many of the Akan, who number some 16 million, work in urban districts.

Akbar in full Abu al-Fath Jalal al-DTn Muhammad Akbar

(b. Oct. 15, 1542, Umarkot, Sind, India — d. 1605, A*gra) Greatest of the Mughal emperors (see Mughal dynasty) of India (r. 1556-1605). Akbar, whose ancestors included Timur and Genghis Khan, ascended the throne as a youth. Initially his rule extended only over the Punjab and the area around Delhi. The Rajput raja of Amber (Jaipur) acknowledged his suzerainty in 1562, and other Rajput rajas followed suit. Akbar included Rajput princes and other Hindus in the highest ranks of his government and reduced discrimination against non-Muslims. He continued his conquests, taking Gujarat in the west (1573) and Bengal in the east (annexed in 1576). Toward the end of his reign he conquered Kashmir (1586) and moved south into the Deccan. Administratively, he strengthened central power, establishing that all military officers and civil administrators were to be appointed by the emperor. He encouraged scholars, poets, painters, and musicians, making his court a centre of culture. He had Sanskrit classics translated into Persian and was enthusiastic about the European paintings presented to him by Jesuit missionaries. His reign was often portrayed as a model by later governments — strong, benevolent, tolerant, and enlightened. See also Babur.

Akerlof, George A. (b. June 17, 1940, New Haven, Conn., U.S.) U.S. economist. He studied at Yale University (B.A., 1962) and the Massachusetts Institute of Technology (Ph.D., 1966) and in 1966 began teaching at the University of California, Berkeley, becoming Goldman Professor of Economics in 1980.

Akerlof s research often drew on other disciplines, including psychology, anthropology, and sociology, and he played an important role in the development of behavioral economics. His landmark study on asymmetric information in the used car market demonstrated how markets malfunction when sellers have more information than buyers. Akerlof shared the 2001 Nobel Prize for Economics with A. Michael Spence and Joseph E. Stiglitz.

Akhenaton or Akhnaton \ak-'na-t 3 n\ orig. Amenhotep Ya-m3n-'ho-,tep\ IV (r. 1353-36 bc)

Egyptian pharaoh of the 18th dynasty (1539-1292 bc). He came to power during a period of Egyptian preeminence, with Egypt controlling Palestine, Phoenicia, and Nubia.

Akhenaton, detail of the sandstone pillar statue from the Aton temple at Karnak, c. 1 370 bc; in the Egyptian Museum, Cairo.

HIRMER FOTOARCHIV, MUNCHEN

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Shortly after his reign began, he began to encourage the exclusive worship of the little-known deity Aton, a sun god he regarded as the source of all blessings. Assuming the name Akhenaton (“One Useful to Aton”), he moved his capital from Thebes to present-day Tell el-Amarna to escape established religious powers and make a fresh start. A new art style that focused on the details of actual life rather than on timeless conditions became popular. In government, Akhenaton tried to recapture the old

authority of the ruler, which had been largely diverted to bureaucrats and officials, but his focus on his new religion to the exclusion of affairs of state resulted in the disintegration of Egypt's Asian empire. He was succeeded by two of his sons-in-law, Smenkhkare and Tutankhamen, but after Tutankhamen's early death the army took over the throne, and Akhenaton' s new religion was abandoned.

Akhmatova Xok-'ma-to-voX, Anna orig. Anna Andreyevna Gorenko (b. June 23, 1889,

Bolshoy Fontan, near Odessa,

Ukraine, Russian Empire — d. March 5, 1966, Domodedovo, near Moscow) Russian poet. She won fame with her first poetry collections (1912, 1914). Soon after the Revolution of 1917, Soviet authorities condemned her work for what they perceived as its narrow preoccupation with love and God, and in 1923, after the execution of her former husband on conspiracy charges, she entered a long period of literary silence. After World War II she was again denounced and expelled from the Writers Union. Following Joseph Stalin's death in 1953, she was slowly rehabilitated. In her later years she became the influential centre of a circle of younger Russian poets. Her longest work, Poem Without a Hew, is regarded as one of the great poems of the 20th century. Regarded today as one of the greatest of all Russian poets, she is also admired for her translations of other poets' works and for her memoirs.

Akiba ben Joseph Xa-'ke-va-ben-'jo-zofX (b. ad 40 — d. c. 135, Caesarea, Palestine) Jewish sage, one of the founders of rabbinic Judaism. He is said to have been an illiterate shepherd who began to study after age 40. He believed that Scripture contained many implied meanings in addition to its overt meaning, and he regarded written law (Torah) and oral law (Halakhah) as ultimately one. He collected and systematized the oral traditions concerning the conduct of Jewish social and religious life, thus laying the foundation of the Mishna. He may have been involved in Bar Kokhba's unsuccessful rebellion against Rome; he gave the rebel leader his title and recognized him as the Messiah. He was imprisoned by the Romans and martyred for his public teaching. See also Ishmael ben Elisha.

Akihito \a-'ke-he-,to\ or Heisei \'ha-'sa\ emperor (b. Dec. 23, 1933, Tokyo, Japan) Emperor of Japan from 1989. Son of Hirohito, his role, like that of his father after 1945, has been largely ceremonial. He is the first Japanese emperor to have married a commoner, in what was hailed at the time as a love match rather than the customary arranged marriage. His children are Crown Prince Naruhito, Prince Akishino, and Princess Nori.

Akita \o -'ke-toX Breed of working dog that originated in the mountains of northern Japan. In 1931 the Japanese government designated the breed as a national treasure. It is a powerful, muscular dog with a broad head, erect pointed ears, and a large curved tail carried over the back or curled

against the flank. Colours and markings vary, including all-white, brindle, and pinto. All but the white akitas bear a distinct mask (dark area around the muzzle). Males stand 26-28 in. (66-71 cm) high, females 24-26 in. (60-66 cm).

Akkad Va -kad\ Ancient region, central Iraq. Akkad was the northern division of ancient Babylonia (Sumer was the southern division). Its name was taken from the city of Agade, founded by the conqueror Sargon c. 2300 bc. Sargon united the city-states in the region and extended the empire to much of Mesopotamia, including Sumer, Elam, and the upper Tigris. The empire waned in the 22nd century bc. Under the kings of Akkad, their Semitic language, Akkadian, became a literary language, and great art was fostered.

Akkadian Xo-'ka-de-onX language or Assyro-Babylonian language Semitic language spoken in Mesopotamia in the 3rd-lst millennia bc. It is known from a great many inscriptions, seals, and clay tablets in cuneiform writing. Akkadian supplanted Sumerian as the major spoken language of southern Mesopotamia by 2000 bc and about this time split into an Assyrian dialect spoken in the northeast and a Babylonian dialect spoken in the south. Akkadian died out as a vernacular in the first half of the 1st millennium bc, being effectively replaced by Aramaic in Mesopotamia, though it continued to be written until about the 1st century ad.

'Akko Va -ko\ or Acre Va-kro, ‘a-korX Seaport town (pop., 2000 est.: 45,737), northwestern Israel. First mentioned in an Egyptian text from the 19th century bc, it was long a Canaanite and Phoenician city. After its conquest by Alexander the Great (336 bc), it was a Greek polity (called Philadelphus), and for several centuries it remained part of the Roman Republic and Empire. The Persians (614) and Arabs (638) conquered the town, but it was ruled by the Turkish SeuOq dynasty when the Crusaders captured it in 1104. The Crusaders renamed the city St. Jean d’Acre and made it their last capital (see Crusades). Except for brief intervals, it was under the rule of the Ottoman Empire from 1516 until British forces took it in 1918. It was part of Palestine under the British mandate and became part of Israel in 1948, when most of its Arab inhabitants fled. Notable structures include the Great Mosque and the Crypt of St. John. It is the burial place of Baha’ Ullah, the founder of the Baha’i faith.

Akmola See Astana

Akron City (pop., 2000: 217,074), northeastern Ohio, U.S., on the Cuyahoga River. At 1 ,200 ft (370 m) above sea level, Akron was named for its “high place” (Greek: acros) on the watershed between the Mississippi River and the Great Lakes. Laid out in 1825, the town was assured substantial growth by the completion of two canals (1827, 1840). The abundant water supply and the arrival of the railroads prompted Benjamin Franklin Goodrich to move a rubber factory there in 1871. Akron became known as “rubber capital of the world,” although by the 21st century much production had moved from the area.

Aksum or Axum X'ak-.siimX Ancient kingdom, northern Ethiopia. At its apogee (3rd-6th century ad), Aksum merchants traded as far as Alexandria and beyond the Nile River. The modern town of Aksum (pop., 1994: 27,148), once the kingdom’s capital, is a religious centre best known for its antiquities. It has long been regarded as a holy city for the Ethiopian Orthodox church; according to tradition, King Menilek I, son of Solomon

and the Queen of Sheba, brought the Ark of the Covenant there from Jerusalem. Aksum’ s antiquities have made it a tourist centre.

Akwamu X'ak-wa-miiX Historical state of western Africa’s Gold Coast (now Ghana). Founded by an Akan people c. 1600, it grew rich on the sale of gold. At its height in the early 18th century, Akwamu stretched more than 250 mi (400 km) along the coast, from Whydah (now Ouidah, Benin) in the east to beyond Winneba (now in Ghana) in the west. By 1710 the state was being pressured by other groups (including the Asante) that had grown powerful in the area, and by 1731 it had ceased to exist.

Al Among Arab groups, a term denoting a tribe, clan, family, or other patrilineal filiation. It often refers to a ruling line or dynasty and generally precedes a substantive name (e.g., Al Sa'ud) but is not connected by a hyphen; it is unrelated to the Arabic definite article, al-. In Britannica Concise Encyclopedia, entries for Arab tribal and dynastic groups are alphabetized under the substantive (e.g., for Al Sa'ud, see Sa'Gd dynasty).

al- Arabic definite article, meaning “the.” It prefixes Arabic nouns, from which it is generally separated by a hyphen when rendered in Latin script. In Britannica Concise Encyclopedia, entries are alphabetized under the noun the article modifies (e.g., see Azhar University, al-).

Al-Jazirah See Gezira

al-Khwarizmi Xal-'kwar-iz-meX Arabic in full Muhammad ibn Musa al-Khwarizmi (b. c. 780, Baghdad, Iraq — d. c. 850) Muslim mathematician and astronomer. He lived in Baghdad during the golden age of Islamic science and, like Euclid, wrote mathematical books that collected and arranged the discoveries of earlier mathematicians. His Al-Kitdb al-mukhtasar fi hisdb al-jabr wa’l-muqabala (“The Compendious Book on Calculation by Completion and Balancing”) is a compilation of rules for solving linear and quadratic equations, as well as problems of geometry and proportion. Its translation into Latin in the 12th century provided the link between the great Hindu and Arab mathematicians and

Anna Akhmatova.

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European scholars. A corruption of the book’s title resulted in the word algebra’, a corruption of the author’s own name resulted in the term algorithm.

Alabama State (pop., 2000: 4,447,000), southern central U.S. It is bor-

dered by Tennessee, Georgia, Florida, and Mississippi; the Gulf of Mexico lies to the southwest. Covering 51,718 sq mi (133,950 sq km), its capital is Montgomery. Its original inhabitants included Cherokee, Chickasaw, Choctaw, and Creek Indians; evidence of their activity can be found near Tuscaloosa. Hernando de Soto traveled there, and the French founded a settlement at Fort Louis in 1702. The Alabama Territory was created in 1817, and statehood was granted in 1819. Alabama seceded from the Union in 1861, becoming part of the Confederacy; it was readmitted in 1868. Efforts during Reconstruction to include blacks in government failed, and Alabama remained segregationist until the 1960s. Dependent on cotton until the early 20th century, the state has since diversified its agricultural production and developed industrially, especially at Birmingham; Mobile has become a major ocean terminal.

Alabama claims U.S. maritime grievances against Britain in the American Civil War. Although Britain had declared official neutrality in the war, it allowed the Confederate cruiser Alabama , which later destroyed 68 Union ships, to be constructed in England. U.S. ambassador Charles Francis Adams demanded that the British take responsibility for these damages, and he advocated arbitration to settle the matter. In May 1871 the parties signed the Treaty of Washington, which established certain wartime obligations of neutrals. The tribunal also held Britain liable for losses and awarded the U.S. damages of $15.5 million.

Alabama River River, southern Alabama, U.S. Formed by the Coosa and Tallapoosa rivers northeast of Montgomery, it winds westward to Selma and then flows southward. The river’s navigable length is 305 mi (491 km). It is joined above Mobile by the Tombigbee River to form the Mobile and Tensaw rivers, which flow into Mobile Bay. Mobile and Montgomery became major cities largely because they were on this important artery.

alabaster Fine-grained gypsum that has been used for centuries for statuary, carvings, and other ornaments. It normally is snow-white and translucent but can be artificially dyed; it may be made opaque and similar in appearance to marble by heat treatment. Florence, Livorno, Milan, and Berlin are important centres of the alabaster trade. The alabaster of the ancients was a brown or yellow onyx marble.

Alaca Huyuk V.a-la-'ja-hoe-.ymkX Ancient Anatolian site, north-central Turkey. It lies northeast of the old Hittite capital of Bogazkoy. Traces of a Hittite building were found in the early 20th century and below them a royal necropolis of tombs from c. 2500 bc. There is evidence of the advanced accomplishments of Copper Age metallurgy in the form of jewelry, bowls, and jugs. Though the ethnic identity of the preliterate inhabitants is uncertain, they probably belonged to the non-Indo-European population that preceded the Hittites.

Aladdin Hero of a well-known story in The Thousand and One Nights. The son of a poor widow, Aladdin is a lazy, careless boy who meets an African magician claiming to be his uncle. He sends Aladdin into a cave to find a magic lamp, but Aladdin refuses to hand over the lamp until he is safely out of the cave. The angry magician shuts the boy in the cave and departs, but Aladdin discovers that he can summon powerful genies (jinn) by rubbing the lamp. The genies grant his every wish, and Aladdin becomes rich, marries the sultan’s beautiful daughter, and reigns for many years.

Alamein, Battles of El See Battles of El Alamein

AlamgTr \'al-3m-,ger\ II in full 'Aziz al-DIn 'Alamglr II (b. June 6, 1699, Multan, India — d. Nov. 29, 1769, Delhi) Mughal emperor of India (1754-59). He was placed on the throne by the imperial vizier Imad al-Mulk Ghazi al-DIn and was always the puppet of more powerful men, including the Afghan ruler Ahmad Shah Durrani, whose agents occupied Delhi in 1757 and made Alamglr the nominal emperor of Hindustan. He was murdered by Ghazi al-DIn, who feared Alamglr might be captured and used against him in another Afghan invasion.

Alamo Eighteenth-century mission in San Antonio, Texas, site of a historic siege of a small group of Texans by a Mexican army (1836) during the Texas war for independence from Mexico. The abandoned mission was occupied occasionally by Spanish troops, who named it the Alamo

("cottonwood") after the surrounding trees. At the start of the war in December 1835, volunteers occupied the Alamo and vowed to fight to the death any attempt to recapture it. In February 1836 a Mexican army of several thousand began a siege that lasted 13 days. The Texan force of about 180, led by Jim Bowie and including Davy Crockett, was overrun; nearly all the defenders were killed (about 15 persons, mostly women and children, were spared). Mexican casualties were at least 600. "Remember the Alamo!" became a rallying cry for Texans through the remainder of the war.

Alanbrooke (of Brookeborough), Alan Francis Brooke, 1 st Viscount (b. July 23, 1883, Bagneres-de-Bigorre, France — d. June 17, 1963, Hartley Wintney, Hampshire, Eng.) British military leader. He served in World War I and later became director of military training (1936-37) and an expert on gunnery. In World War II he began as commander of a corps in France and covered the Dunkirk evacuation. After serving as commander of the British home forces (1940-41), he was promoted to chief of staff (1941^-6). He established good relations with the U.S. forces and exercised a strong influence on Allied strategy. He was promoted to field marshal in 1944 and created a viscount in 1946.

Aland Vo-,lan\ Islands Archipelago, southwestern Finland, constituting Ahvenanmaan autonomous kunta (commune). It consists of about 35 inhabited islands (pop., 2002 est.: 26,000) and more than 6,000 uninhabited ones, with a total land area of 599 sq mi (1,552 sq km). Aland, the largest island, is the location of Mariehamn, the administrative capital and chief seaport. The islands were Christianized by 12th-century Swedish missionaries. When Finland declared its independence in 1917, the Alanders sought to become part of Sweden. Though the archipelago remains with Finland, it has been given unique autonomy.

alanine Va-lo-nenN Either of two organic compounds. Alpha-alanine is one of the nonessential amino acids, found in most proteins and particularly abundant in fibroin, the protein in silk. It is used in research and as a dietary supplement. Beta-alanine is a naturally occurring amino acid not found in proteins. It is an important constituent of the vitamin pantothenic acid and is used in its synthesis, as well as in biochemical research, electroplating, and organic synthesis.

Alaric Va-lo-rikX I (b. c. 370, Peuce Island — d. 410, Cosentia, Bruttium) Chief of the Visigoths (395-410). He commanded Gothic troops in the

Roman army before leaving to become chief of the Visigoths. He led his tribe into Greece, sacking cities until placated by the Eastern emperor (397). He twice led invasions of Italy, the second time extorting a large payment from the Roman Senate. Alaric’ s forces grew after the Romans massacred the wives and children of Visigoths serving in the Roman army. He besieged Rome (408, 409), proclaiming Priscus Attalus as Western emperor. In 410 Alaric occupied and plundered Rome, the first time the city had been captured by a foreign enemy in 800 years. See also Goths.

Alaska State (pop., 2000: 626,932) of the U.S., lying at the northwest extremity of North America. It is the largest in area of the U.S. states, covering 587,875 sq mi (1,522,595 sq km). Bordered by Canada to the east and southeast and facing Siberia across the Bering Strait and Bering Sea to the west, it has the highest point on the continent, Mount McKinley. Its capital is Juneau. The original inhabitants, Indians and Eskimos, are thought to have migrated over the Bering Land Bridge as well as from the Arctic. The first European settlement was established in the late 18th century by Russian fur traders on Kodiak Island. Hudson's Bay Co. traders were also interested in the same area, and Russian-Canadian trade rivalry lasted well into the 19th century. In 1867 William Seward negotiated Alaska’s sale from the Russians to the U.S., and the subsequent discovery of gold stimulated American settlement. Alaska was a U.S. territory from 1912 until it was admitted as the 49th state in 1959. Its economy has become increasingly centred on oil and natural gas: since the opening of the Trans- Alaska Pipeline in 1977, Alaska has become second only to Texas in the U.S. production of crude oil.

Alaska, Gulf of Broad inlet, southern Alaska, U.S. Situated between the Alaska Peninsula and the Alexander Archipelago, it receives the Susitna and Copper rivers. Ports on the gulf include Anchorage, Seward, and Valdez; the last is North America’s northernmost year-round harbour and the Trans- Alaska Pipeline’s terminal. In 1741 a Russian expedition led by Vitus Bering, a Dane, became the first Europeans to enter the Gulf.

Alaska Highway formerly Alcan Highway Road through the Yukon, connecting Dawson Creek, British Columbia, with Fairbanks,

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Alaska, a distance of 1,523 mi (2,451 km). It was constructed by U.S. Army engineers in 1942 as an emergency war measure to provide an overland military supply route to Alaska. It is a scenic route now open year-round.

Alaska Peninsula Peninsula, southwestern Alaska, U.S. It stretches about 500 mi (800 km) between the Pacific Ocean and Bristol Bay. The volcanic Aleutian Range runs along its entire length. It is the site of Katmai National Park and Preserve, Aniakchak National Monument and Preserve, and the Becherof, Alaska Peninsula, and Izembek national wildlife refuges.

Alaska Pipeline See Trans-Alaska Pipeline

Alaska Purchase Acquisition in 1867 by the U.S. from Russia of 586,412 sq mi (1.5 million sq km) at the northwestern tip of North America, comprising the current U.S. state of Alaska. The territory, held by Russia since 1741, was considered an economic liability, and in 1866 it was offered for sale. Pres. Andrew Johnson's secretary of state, William Seward, negotiated its purchase for $7.2 million, or about two cents per acre. Critics labeled the purchase "Seward's Folly." Congressional opposition delayed the appropriation until 1868, when extensive lobbying and bribes by the Russian minister to the U.S. secured the required votes.

Alaska Range Mountain range, southern Alaska, U.S. A segment of the Pacific mountain system, it extends in an arc from the Aleutian Range on the Alaska Peninsula to the Yukon Territory boundary. Mount McKinley, near the centre of the range, in Denali National Park and Preserve, is the highest point in North America. Many nearby peaks exceed 13,000 ft (4,000 m), including Mounts Silverthrone, Hunter, Hayes, and Foraker. The range is crossed at Isabel Pass by the Trans-Alaska Pipeline.

Alaskan king crab See king crab

Alaskan malamute Sled dog developed by the Malemiut, an Eskimo group. It is a strongly built dog with a broad head, erect ears, and a plumelike tail carried over its back. Its thick coat is usually gray and white or black and white, the colours frequently forming a caplike or masklike marking on the head. It stands 23-25 in. (58-64 cm) tall and weighs 75-85 lbs (34-39 kg). Characteristically loyal and friendly, it has served on expeditions to the Antarctic.

Alaungpaya \a- I la-uq- , pI-3\ dynasty or Konbaung \ 1 kon-ba- , uq\ dynasty (1752-1885) Last ruling dynasty of Myanmar. In the face of the fragmentation of the Toungoo dynasty, Alaungpaya (1714-60), headman in a village near Mandalay, raised an army and subdued the separatist M on people in southern Myanmar and then conquered the northeastern Shan states. He attacked the Siamese capital of Ayutthaya (now in Thailand) but was forced to retreat. His son Hsinbyushin, the third king of the dynasty (r. 1763-76), sent armies into neighbouring kingdoms and successfully rebuffed four retaliatory Chinese invasions. The sixth king, Bodawpaya (r. 1782-1819), mounted a number of unsuccessful campaigns against the Siamese and moved the capital to Amarapura. He also conquered the kingdom of Arakan. His incursions into Assam aroused the ire of the British, and under Bagyidaw (r. 1819-37) Myanmar (subsequently Burma) was defeated in the first Anglo-Burmese War. From then on the dynasty's hold on Myanmar gradually declined, ending in total annexation by the British in 1885.

Alawites See 'Alawiyyah

'Alawiyyah Va-la-we-'ya\ or Alawite \a-b-'wet\ or Nusayriyyah

\nii-sl-re-'ya\ Minority sect of ShTite Islam. The sect, which exists mainly in Syria, traces its roots to the teachings of Muhammad ibn Nusayr al-Namlri (fl. 850) and was chiefly established by Husayn ibn Hamdan al-KhasIbl (d. 957/958). Its basic doctrine includes a deification of 'Ali and an interpretation of the five Pillars of Islam as symbolic. Some of the group's religious practices are secret; it celebrates some Islamic and some Christian holidays.

Alba, Fernando Alvarez de Toledo (y Pimentel), 3rd duke

de (b. Oct. 29, 1507, Piedrahita, Old Castile, Spain — d. Dec. 11, 1582, Lisbon) Spanish soldier. He commanded Charles V's imperial armies to defeat the Schmalkaldic League in 1547, and he served as viceroy of Naples (1556-59). As a chief minister to Philip II, Alba became notorious for his tyranny as governor-general of the Netherlands (1567-73), where he instituted the Council of Troubles. That court set aside local laws and condemned some 12,000 people for rebellion. Recalled to Spain in 1573, Alba later conducted a brilliant campaign against Portugal (1580) but never regained Philip's favor. See photograph above.

albacore Large oceanic tuna (Thunnus alalunga) that is noted for its fine flesh. The streamlined bodies of these voracious predators are adapted to fast and continuous swimming. They occur in both the Atlantic and Pacific oceans and migrate long distances. The bluefin tuna is also sometimes called albacore.

Albani, Francesco or Francesco Albano (b. March 17, 1578, Bologna, Papal States — d. October 1660, Bologna) Italian painter. He trained with the Carracci family in Bologna then moved to Rome in 1601 and collaborated with Annibale Carracci and Domenichino on the decoration of the Farnese Palace. While in Rome he established his own studio and painted frescoes in various churches and palaces. In 1617 he returned to Bologna and produced altarpieces, allegorical paintings, and idyllic landscapes. His best-known paintings are of mythological and poetic subjects.

Albania officially Republic of Albania Country, Balkan Peninsula, southeastern Europe. Area: 11,082 sq mi (28,703 sq km). Population (2005 est.): 3,130,000. Capital: Tirane. Language: Albanian (official).

ous highland and, to the west, an Adriatic

coastal lowland that contains the country's agricultural lands and most of its population. Albania has a developing free-market economy that until 1991 was shaped by a socialist system of state ownership. The Albanians are descended from the Illyrians, an ancient Indo-European people who lived in central Europe and migrated south by the beginning of the Iron Age (see Illyria). The Gegs settled in the north and the Tosks in the south, along with Greek colonizers. The area was under Roman rule by the 1st century bc; after ad 395 it was connected administratively to Constantinople. Turkish invasion began in the 14th century and continued into the 15th; though the national hero, Skanderbeg, was able to resist them for a

time, after his death (1468) the Turks consolidated their rule. The coun-

Fernando Alvarez de Toledo, 3rd duke de Alba, oil painting by Sir Antony More, 1 549; in the Royal Museums of Fine Arts of Belgium, Brussels.

COURTESY OF THE MUSIrES ROYAUX DES BEAUX-ARTS, BRUSSELS

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try achieved independence in 1912 and was admitted into the League of Nations in 1920. It was briefly a republic (1925-28), then became a monarchy under Zog I, whose initial alliance with Italy deteriorated into that country's invasion of Albania in 1939. After the war a socialist government under Enver Hoxha was installed, and gradually Albania cut itself off from the nonsocialist international community and eventually from all other countries, including China, its last political ally. By 1990 economic hardship had fomented antigovernment demonstrations that led to the election of a noncommunist government in 1992 and the end of Albania's international isolation. Early in the 21st century, Albania continued to experience economic uncertainty and ethnic turmoil, the latter involving Albanian minorities in Serbia and Montenegro (see Kosovo conflict) and Macedonia.

Albanian language Indo-European language spoken by five to six million people in Albania, Kosovo in Serbia and Montenegro, western Macedonia, and enclaves elsewhere, including southern Italy and southern Greece. There are two main dialect groups, Gheg (Geg) in the north, including Kosovo and Macedonia, and Tosk in the south. Albanian is the only extant representative of a distinct branch of Indo-European, whose pre-Roman Balkan ancestry is uncertain. The earliest written attestation is from the 15th century, though a standard orthography using the Latin alphabet was not adopted until 1909. The core vocabulary of Albanian is native, though in the course of its history it has absorbed many loanwords from Greek, Latin, Balkan Romance languages (see Romanian), Slavic languages, and Turkish.

Albany Vol-bo-neV City (pop., 2000: 95,658), capital of New York state, U.S. It lies along the Hudson River 145 mi (230 km) north of New York City. The first permanent settlement, named Beverwyck, was built in 1624 by the Dutch. When the British took the area in 1664, the village was renamed to honour the duke of York and Albany. In 1754 the Albany Congress adopted Benjamin Franklin's "Plan of Union." In the 19th century Albany became a major transportation centre. Its focal point today is

Empire State Plaza, a governmental, cultural, and convention complex.

Albany Congress Conference convened by the British Board of Trade in 1754 at Albany, N.Y. They advocated a union of the British colonies in North America, in part to secure a defensive union against the French before the outbreak of the French and Indian War. In addition to colonial delegates, several representatives of the Iroquois Confederacy were present. Delegates including Benjamin Franklin supported a plan to unify the seven colonies, but it was never adopted. The plan became a model for proposals made during the American Revolution.

albatross Any of more than a dozen species of large seabirds (family Diomedeidae). Albatrosses are among the most spectacular gliders of all birds; in windy weather they can stay aloft for hours without flapping their wings. They drink seawater and usually eat squid. Albatrosses come ashore only to breed, in colonies typically established on remote oceanic islands. Adults of common species attain wingspans of 7-11 ft (200-350 cm). Albatrosses live long and may be among the few birds to die of old age. They were once held in awe by seamen, who held that killing one would bring bad luck.

albedo \al-'be-do\ Fraction of light reflected by a body or surface, commonly used in astronomy to describe the reflective properties of planets, natural satellites, and asteroids. “Normal” albedo (the relative brightness of a surface when illuminated and observed from directly above) is often used to determine the surface compositions of satellites and asteroids. The albedo, diameter, and distance of such objects together determine their brightness.

Albee \'ol-be\, Edward (Franklin) (b. March 12, 1928, Virginia, U.S.) U.S. playwright. He was the adopted grandson and namesake of a well-known vaudeville theatre manager. His first one-act play, The Zoo Story (1959), and other early plays, including The Sandbox (I960) and The American Dream (1961), were characteristic of the Theatre of the Absurd. His Who’s Afraid of Virginia Woolf (1962; film, 1966) was widely

acclaimed. He won Pulitzer prizes for A Delicate Balance (1966), Seascape (1975), and Three Tall Women (1991). He has also adapted other writers’ works for the stage, including Vladimir Nabokov’s Lolita (1981).

Albemarle Val-bo-.marL Sound Coastal inlet, northeastern North Carolina, U.S. Protected from the Atlantic Ocean by the Outer Banks, it is about 50 mi (80 km) long and 5-14 mi (8-23 km) wide. It is connected with Chesapeake Bay by the Dismal Swamp Canal and the Albemarle and Chesapeake Canal. Elizabeth City is its chief port. Explored by Ralph Lane in 1586, it was later named for George Monck, duke of Albemarle.

Albeniz\al-'ba-neth\, Isaac (Manuel Francisco) (b. May 29, 1860, Camprodon, Spain — d. May 18, 1909, Cambo-les-Bains, France) Span-

ish composer. A piano prodigy by age four, he later studied in Leipzig and Brussels, returned to Spain to teach in Barcelona and Madrid, and then moved to France in 1893. His fame rests on his piano pieces, which, under the influence of Felipe Pedrell, utilize the melodic styles, rhythms, and harmonies of Spanish folk music. Iberia (1905-09) is a set of 12 virtuoso piano pieces; other piano works include the Suite espahola (1886), Cantos de Espaha (1896), and five sonatas. He also wrote several operas.

Albers, Josef (b. March 19, 1888, Bottrop, Ger. — d. March 25, 1976, New Haven, Conn., U.S.) German-U.S. painter, poet, teacher, and theoretician. He studied and taught at the Bauhaus and in 1933 became one of the first Bauhaus teachers to immigrate to the U.S. , where he taught at Black Mountain College and later at Yale. He developed a painting style characterized by abstract rectilinear patterns and primary colours as well as black and white. His best-known series of paintings. Homage to the Square (begun in 1950 and continued until his death), restricts its repertory of forms to coloured squares superimposed onto each other. The arrangement of these squares is carefully calculated so that the colour of each square optically alters the sizes, hues, and spatial relationships of the others. His research into colour theory was published in the influential Interaction of Color (1963).

Albert, prince consort of Great Britain and Ireland orig. Franz Albrecht August Karl Emanuel, prince von Sachsen-Coburg-Gotha (b. Aug. 26, 1819, Schloss Rosenau, near Coburg, Saxe-Coburg-Gotha — d. Dec. 14, 1861, Windsor Castle, Berkshire, Eng.) Prince consort of Queen Victoria of Britain and father of Edward VII. Albert married Victoria, his first cousin, in 1 840 and became in effect her private secretary and chief confidential adviser. Their domestic happiness helped assure the continuation of the monarchy, which had been somewhat uncertain. Though the German-born Albert was undeservedly unpopular, the British public belatedly recognized his worth after his death at age 42 from typhoid fever. In the ensuing years the grief- stricken queen made policy decisions based on what she thought Albert would have done.

Albert, Lake Lake, east-central Africa. Lying at an altitude of 2,02 1 ft (616 m), it is 100 mi (160 km) long and has an average width of about 20 mi (32 km). In the southwest, the Semliki River brings into the lake the waters of Lake Edward; at its northeastern corner, just below Murchison Falls, it receives the Victoria Nile from Lake Victoria. In 1864 the lake's first European visitor, Samuel Baker, named it after Queen Victoria's consort. Initially part of Uganda, it now forms part of the Uganda-Congo border.

Albert I (b. April 8, 1875, Brussels, Belg. — d. Feb. 17, 1934, Marches-les-Dames, near Namur) King of the Belgians (1909-34). He succeeded his uncle, King Leopold II, in 1909. He strengthened the army while reaffirming Belgian neutrality in 1914, rejecting William ll's demand (Aug. 2,

1914) for free passage of German troops across Belgium. Following the Armistice he sought to abolish Belgian neutrality, supported universal male suffrage, and guided the country’s rebuilding effort.

Albert National Park See Virunga National Park
Albert the Great, Saint See Saint Albertus Magnus

"Join, or Die," the first known American cartoon, published by Benjamin Franklin in his Pennsylvania Gazette,

1 754, to support his plan for colonial union presented at the Albany Congress

THE GRANGER COLLECTION, NEW YORK

Josef Albers, photograph by Arnold Newman, 1948.

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Alberta Province (pop., 2001: 2,974,807), Canada, westernmost of three Prairie Provinces. With an area of 255,287 sq mi (661,190 sq km), Alberta is bordered by Saskatchewan, British Columbia, the Northwest Territories, and the U.S. Its capital is Edmonton. Long inhabited by various Indian peoples, the area was explored by Europeans in the 1750s. It eventually came under the rule of the Hudson's Bay Co., which transferred it to the Dominion of Canada in 1870. It was made part of the Northwest Territories in 1882. Its population grew with the coming of the railroads and the expansion of wheat farming. Alberta was made a province in 1905. Once dependent on agriculture, it underwent economic growth with the discovery of oil in 1947 and the ensuing discovery of other major oil and gas deposits.

Alberta, University of Canadian public university in Edmonton. Opened in 1908, it is one of Canada’s five largest research universities. It offers undergraduate and graduate programs in liberal arts, agriculture and forestry, science and engineering, business, law, education, and the health professions. Special programs include the School of Native Studies and the Faculte Saint-Jean, which conducts all study in French and also offers a bilingual Bachelor of Commerce degree.

Alberti, Leon Battista (b. Feb. 14, 1404, Genoa— d. April 25. 1472,

Rome) Italian architect, art theorist, and humanist. After pursuing a literary career as papal secretary, in 1438 Alberti was encouraged to direct his talents toward the field of architecture. His designs for the Palazzo Rucellai (c. 1445-51) and the facade of Santa Maria Novella (1456-70), both in Florence, are noted for their harmonic proportions. His central-plan church of Sant' Andrea, Mantua (begun 1472), with its triumphal-arch motif, is an early Renaissance masterpiece. Alberti was one of the foremost theorists on Renaissance architecture and art, known for codifying the principles of linear perspective (in On Painting, 1436). A prototype of the Renaissance man, he also made contributions to moral philosophy, cartography, and cryptography.

Albertus Magnus, Saint (b. c. 1200, Lauingen on the Danube, near Ulm, Bavaria — d. Nov. 15, 1280,

Cologne; canonized Dec. 16, 1931; feast day November 15) German cleric, theologian, and philosopher.

Son of a wealthy German lord, he studied at Padua, where he joined the Dominican order (1223). At the University of Paris he was introduced to the works of Aristotle and to Averroes' commentaries and decided to present to his contemporaries the entire body of human knowledge as seen by Aristotle and his commentators. For 20 years he worked on his Physica, which encompassed natural science, logic, rhetoric, mathematics, astronomy, ethics, economics, politics, and metaphysics. He believed that many points of Christian doctrine were recognizable both by faith and by reason. In 1248 he organized the first Dominican studium generale ("general house of studies," a precursor to the university) in Germany, at Cologne. Thomas Aquinas, who had been with Albertus in Paris and joined him in Cologne, was his chief disciple at this time. His works represented the entire body of European knowledge of his time, and he contributed greatly to the development of natural science.

Albigensian \,al-b3-'jen-sh3n\ Crusade (1209-29) Crusade called by Pope Innocent III against the heretical Cathari of southern France. The war pitted the nobility of northern France against that of southern France, and it eventually involved the king of France who established his authority over the south. The Crusade ended with the Treaty of Paris (1229), which took away the independence of the southern princes and largely destroyed the culture of Provence. The Crusade caused much devastation and injustice, which Innocent came to regret, but did not bring about the extirpation of the Albigensian heresy (named for its center in the town of Albi, France). The heresy lingered on into the 13th— 14th centuries and became the object of the Inquisition.

Albigensians See Cathari

albinism Val-bo-.ni-zom, al-'bl-.ni-zoirA Absence of the pigment melanin in the eyes, skin, hair, scales, or feathers. It arises from a genetic defect and occurs in humans and other vertebrates. Because they lack the pigments that normally provide protective coloration and screen against the sun’s ultraviolet rays, albino animals rarely survive in the wild. Humans have long intentionally bred certain albino animals (e.g., rabbits) for their appearance. In humans with generalized, or total, albinism, the affected person has milk-white skin and hair; the iris of the eye appears pink, the pupil red. Vision abnormalities such as astigmatism, nystagmus (rapid involuntary oscillation of the eye), and photophobia (extreme sensitivity to light) are common. Generalized albinism occurs throughout the world in about one in 20,000 persons.

Albinoni \,al-b3-'no-ne\, Tomaso (Giovanni) (b. June 8/14, 1671, Venice — d. Jan. 17, 1751, Venice) Italian composer. Born to a wealthy Venetian family, he was not obliged to work for a living and became a highly prolific composer. He had more than 50 operas successfully produced between 1694 and 1741, though few survive. His approximately 60 concertos became popular; he also wrote more than 80 sonatas for various instrumental combinations and many solo cantatas. These works are distinguished above all by their melodic charm.

Albinus \al-'be-nos\, Bernard Siegfried (b. Feb. 24, 1697, Frankfurt an der Oder, Brandenburg — d. Sept. 9, 1770, Leiden, Neth.) German-bom Dutch anatomist. A professor at the University of Leiden, he is best known for the excellent engravings in his Tables of the Skeleton and Muscles of the Human Body (1747). He was the first to show the connection of the vascular systems of mother and fetus. With Hermann Boerhaave, he edited the works of Andreas Vesauus and William Harvey.

albite Common feldspar mineral, a sodium aluminosilicate (NaAlSi 3 0 8) that occurs most widely in pegmatites and acid igneous rocks such as granites. It may also be found in low-grade metamorphic rocks (those formed under relatively low temperature and pressure conditions) and in certain sedimentary rocks. Albite usually forms brittle, glassy crystals that may be colourless, white, yellow, pink, green, or black. It is used in the manufacture of glass and ceramics, but its primary geologic importance is as a rock-forming mineral.

Albright, Ivan (Le Lorraine) (b. Feb. 20, 1897, North Harvey, 111., U.S. — d. Nov. 18, 1983, Woodstock, Vt.) U.S. painter. He was the son of a painter. Independently wealthy, he studied at various institutions, developing a meticulously detailed style and often spending several years of painstaking work on a single painting. With pinpoint exactness and hallucinatory hyperclarity, he repeatedly depicted decay, corruption, and the wreckage of age, often with great emotional intensity. Among his important works is That Which I Should Have Done I Did Not Do (1931-41). He gained fame with his portrait (1 943 — 44) of the title character in the film The Picture of Dorian Gray (1945), depicting the final stage of Gray’s dissolute life.

albumin Val-'byti-monX Any of a diverse class of proteins historically defined by their ability to dissolve in water and in a half-saturated (see saturation) solution of ammonium sulfate. They are readily coagulated by heating. Examples include serum albumin, a major component of plasma; a-lactalbumin, found in milk; ovalbumin, which makes up about half the proteins of egg white; and conalbumin, another egg-white protein. Ovalbumin is used commercially in the food, wine, adhesives, paper coatings,

pharmaceutical, and other industries and in research.

Albuquerque Val-bo-jkor-keN City (pop., 2000: 448,607), New Mexico, U.S. The state's largest city, it lies on the Rio Grande southwest of Santa Fe. Founded by the governor of New Mexico, it was named for the duke de Alburquerque (the first r was later dropped), the viceroy of New Spain. After 1800 growing commerce on the Santa Fe Trail brought an influx of settlers; an army post was established following U.S. occupation in 1846. With the coming of the railroad in 1880, the population expanded. The characteristically Spanish "old town" and its mission church (1706) have survived. Since the 1930s many defense-related federal agencies have been established there.

Albuquerque V.al-bu-'kor-koN, Afonso de or Afonso the Great

(b. 1453, Alhandra, near Lisbon — d. Dec. 15, 1515, at sea, off Goa, India) Portuguese soldier, conqueror of Goa (1510) and of Melaka (1511). He gained military experience as a soldier in North Africa for 10 years but made his reputation fighting in Asia. He paved the way for Portuguese domination in Southeast Asia through efforts to gain control of all the

Albertus Magnus, detail of a fresco by Tommaso da Modena, c. 1 352; in the Church of San Nicolo, Treviso, Italy.

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main maritime trade routes of the East and to build permanent fortresses with settled populations. His conquests were inspired by the Crusading spirit of King John II, rather than by considerations of mercantile gain.

Alcaeus \al-'se-9s\ or Alkaios \al-'ka-9s\ (b. c. 620 bc, Mytilene, Lesbos — d. c. 580 bc) Greek lyric poet. Only fragments and quotations survive from his work, consisting of hymns in honour of gods and heroes, love poetry, drinking songs, and political poems. Many reflect Alcaeus's vigorous involvement in the life of his native Mytilene, particularly its political life. His poetry was a favorite model for Horace, who adapted from him his own alcaic stanza.

Alcala Zamora, Niceto (b. July 6, 1877, Priego, Spain — d. Feb. 18, 1949, Buenos Aires, Arg.) Spanish politician. After serving as minister of works (1917) and minister of war (1922), he opposed the dictatorship of Miguel Primo de Rivera and joined the Republican movement. As leader of the revolutionary committee that successfully demanded the abdication of Alfonso XIII, he became head of the government in 1931 and was elected president of Spain's Second Republic that same year. He tried to

moderate the policies of the extremist factions, but he was deposed in 1936 after the election of the Popular Front and went into exile to France and then to Argentina.

Alcamenes or Alkamenes yal-'kam-o-.nezV (b. 5th century bc, Lemnos, in the Aegean Sea, and Athens) Greek sculptor. A younger contemporary of Phidias, he was noted for the delicacy and finish of his works, among which a Hephaestus and an Aphrodite of the Gardens are noteworthy. A copy of the head of his Hermes Propylaeus at Pergamum has been identified by an inscription, and he is said by the Greek traveler Pausanias (2nd century ad) to have been the creator of one of the pediments of the Temple of Zeus at Olympia.

Alcan Highway See Alaska Highway

Alcatraz Island Rocky island in San Francisco Bay, California, U.S. It has an area of 22 acres (9 hectares) and is located 1.5 mi (2 km) offshore from the city of San Francisco. The site of the first lighthouse (1854) on the California coast, it became an army garrison (1859) and a military prison (1868). From 1934 to 1963 it served as a federal prison for dangerous civilian prisoners. Its famous inmates included Al Capone, George “Machine Gun” Kelly, and Robert Stroud, the “Birdman of Alcatraz.” It is now open to the public.

alcazar \al-'ka-z3r\ Spanish alcazar Form of military architecture of medieval Spain, generally rectangular with defensible walls and massive comer towers. Inside was an open space (patio) surrounded by chapels, salons, hospitals, and sometimes gardens. The finest surviving example from the Moorish period is Sevilla’s Alcazar Palace; begun in 1181 under the Almohads and continued by the Christians, it exhibits both Moorish and Gothic features, including a decagonal brick tower, the Torre del Oro.

Toledo alcazar, 14th century, renovated 16th century, severely damaged during the Spanish Civil War and later restored.

© GETTY IMAGES

Alcestis \al-'ses-t9s\ In Greek legend, the beautiful daughter of Pelias, king of Ioclos. Admetus, son of the king of Pherae, sought her hand. To win her he was required to harness a lion and a boar to a chariot, and he succeeded with the aid of Apollo. When Apollo learned that Admetus had not long to live, he persuaded the Fates to prolong his life, on condition someone else die in his stead. As a loyal wife Alcestis consented to do so, but was rescued by Heracles, who wrestled with Death at her grave. Her story is told in Euripides' Alcestis.

alchemy Pseudoscience focused on the attempt to change base metals into gold. Ancient alchemists believed that, under the correct astrological conditions, lead could be “perfected” into gold. They tried to hasten this transformation by heating and refining the metal in a variety of chemical processes, most of which were kept secret. Alchemy was practiced in much of the ancient world, from China and India to Greece. It migrated to Egypt during the Hellenistic period and was later revived in 12th-century Europe through translations of Arabic texts into Latin. Medieval European alchemists made some useful discoveries, including mineral

acids and alcohol. The revival led to the development of pharmacology under the influence of Paracelsus and to the rise of modem chemistry. Not until the 19th century were the gold-making processes of alchemists finally discredited.

Alcibiades N.al-so-'bl-o-.dezV (b. c. 450 bc, Athens — d. 404, Phrygia) Athenian politician and commander. Pericles was his guardian, his father having died in battle. Alcibiades grew up without much guidance, but as a youth he was drawn to Socrates' moral strength and keen mind. Socrates, in turn, was attracted to the youth's physical beauty and intellectual promise. They served together in the Peloponnesian War, saving each other's life in battle, yet eventually Alcibiades was led by his own unscrupulous ambition. By 420 he was a general. Recalled from a Sicilian expedition in 415 on charges of sacrilege, he fled to Sparta. Though he aided the Spartan cause against Athens, he was eventually rejected and sought haven with the Persian governor at Sardis. The Athenian fleet eventually recalled him, and he directed Athenian victories 411-408. Though he achieved hero status, his enemies forced him to leave. From Thrace he warned Athens presciently of danger at the Battle of Aegospotami. He fled from Thrace to Phrygia, where the Spartans conspired to have him murdered. His political agitation was a decisive factor in the defeat of Athens in the Peloponnesian War. His notorious behaviour helped strengthen the charges brought against Socrates in 399.

Alcmaeon or Alcmeon \alk-'me-3n\ In Greek mythology, the son of the seer Amphiaraus. The seer had been persuaded by his wife to join the expedition of the Seven Against Thebes. On realizing that he would die, he charged Alcmaeon and his other sons with avenging his death. Alcmaeon led the sons of the seven in the destruction of Thebes and then obeyed his father's injunction to kill his mother, a crime for which the Furies drove him mad. He was purified by King Phegeus of Psophis, whose daughter he married but subsequently killed. Following the advice of an oracle, he settled on an island at the mouth of the Achelous River, where he married again, but was killed by Phegeus and his sons.

Alcmaeonid family \alk-'me-9n-id\ Athenian family important in the 6th-5th century bc. During the archonship (magistracy) of the Alcmaeonid Megacles (632? bc), the family was banished for murder; it returned twice to oust the tyrant Peisistratus before again being exiled. Megacles' son Cleisthenes became archon in 525/524, but in 514 Peisistratus' son Hippias again exiled the family for murdering his brother. The family reestablished itself after the Spartans drove out the Peisistratids in 510. The next generation may have aided the Persians at the Battle of Marathon (490). Alcibiades and Pericles were both Alcmaeonids.

Alcoa U.S. company, the world's largest producer of aluminum. Established in Pittsburgh, Pa., in 1888, it adopted the name Aluminum Co. of America in 1907. Alcoa introduced aluminum foil in 1910 and found uses for aluminum in the emerging aviation and automobile industries. In 1913 it established the town of Alcoa in eastern Tennessee as a planned industrial community. A 1945 federal antitrust ruling obliged it to sell its Canadian subsidiary (now Alcan Aluminum Ltd., its strongest competitor). In 1998 Alcoa acquired Alumax Inc. Alcoa's other products include plastic containers and packaging equipment.

alcohol Any of a class of common organic compounds that contain one or more hydroxyl groups (— OH) attached to one or more of the carbon atoms in a hydrocarbon chain. The number of other substituent groups

(R) on that carbon atom make the alcohol a primary (RCH 2 OH), second-

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ary (R 2 CHOH), or tertiary (R 3 COH) alcohol. Many alcohols occur naturally and are valuable intermediates in the synthesis of other compounds because of the characteristic chemical reactions of the hydroxyl group. Oxidation (see oxidation-reduction) of primary alcohols yields aldehydes and (if taken further) carboxylic acids; oxidation of secondary alcohols, ketones. Tertiary alcohols break down on oxidation. Alcohols generally react with carboxylic acids to produce esters. They may also be converted to ethers and olefins. Products of these numerous reactions include fats and waxes, detergents, plasticizers, emulsifiers, lubricants, emollients, and foaming agents. Ethanol (grain alcohol) and methanol (wood alcohol) are the best-known alcohols with one hydroxyl group. Glycols (e.g., ethylene glycol, or antifreeze) contain two hydroxyl groups, glycerol three, and polyols three or more. See also alcoholic beverage, alcoholism.

alcoholic beverage Any fermented liquor, such as wine, beer, or distilled liquor, that contains ethyl alcohol, or ethanol, as an intoxicating agent. When an alcoholic beverage is ingested, the alcohol is rapidly absorbed in the stomach and intestines because it does not undergo any digestive processes. It is distributed to the rest of the body through the blood and has a pronounced depressant action on the brain. Under the influence of alcohol, the drinker is less alert, less able to discern objects in the environment, slower in reacting to stimuli, and generally prone to sleep.

Alcoholics Anonymous (AA) Voluntary fellowship of people suffering from alcoholism who seek to become and stay sober through mutual self-help by meeting in local, independent groups to share their common experience. Anonymity, confidentiality, and understanding of alcoholism as a disease free members to speak frankly. Many consider AA to be the most successful method of coping with alcoholism; participation raises the chances of success of other treatments. Its 12 steps to recovery include acknowledgment of the problem, faith in a “higher power” as understood by each individual, self-examination, and a desire to change for the better and to help others recover. Begun in 1935 by two alcoholics, AA has grown to some 2 million members worldwide. Similar organizations for abusers of other substances and for habitual gamblers and debtors are based on its principles.

alcoholism Excessive habitual consumption of alcoholic beverages despite physical, mental, social, or economic harm (e.g., cirrhosis, drunk driving and accidents, family strife, frequently missing work). Persons who drink large amounts of alcohol over time become tolerant to its effects. Alcoholism is usually considered an addiction and a disease. The causes are unclear, but there may be a genetic predisposition. It is more common in men, but women are more likely to hide it. Treatment may be physiological (with drugs that cause vomiting and a feeling of panic when alcohol is consumed; not an effective long-term treatment), psycho-

logical (with therapy and rehabilitation), or social (with group therapies). Group therapies such as Alcoholics Anonymous are the most effective treatments. Suddenly stopping heavy drinking can lead to withdrawal symptoms, including delirium tremens.

Alcott, (Amos) Bronson (b. Nov. 29, 1799, Wolcott, Conn., U.S. — d. March 4, 1888, Concord, Mass.) U.S. teacher and philosopher. The self-educated son of a poor farmer, Alcott worked as a peddler before establishing a series of innovative but ultimately unsuccessful schools for children. He traveled to Britain with money borrowed from Ralph Waldo Emerson and came back with the mystic Charles Lane, with whom he founded the short-lived utopian community Fruitlands outside Boston. Alcott is credited with establishing the first parent-teacher association in Concord, Mass., while he was superintendent of schools there. A prominent member of the Transcendentalists, he wrote a number of books but did not become financially secure until his daughter Louisa May Alcott achieved success.

Alcott, Louisa May (b. Nov. 29, 1832, Germantown, Pa., U.S. — d. March 6, 1888, Boston, Mass.) U.S. author. Daughter of the reformer Bronson Alcott, she grew up in Transcendentalist circles in Boston and Concord, Mass. She began writing to help support her mother and sisters. An ardent abolitionist, she volunteered as a nurse during the American Civil War, where she contracted the typhoid that damaged her health the rest of her life; her letters, published as Hospital Sketches (1863), first brought her fame. With the huge success of the autobiographical Little Women (1868-69), she finally escaped debt. An Old-Fashioned Girl (1870), Little Men (1871), and Jo’s Boys (1886) also drew on her experiences as an educator. See photograph above.

Alcuin \'al-,kwen\ (b. c. 732, in or near York, Yorkshire, Eng. — d. May 9, 804, Tours, France) Anglo-Latin poet, educator, and cleric. As head of Charlemagne’s Palatine school, he introduced the traditions of Anglo-Saxon humanism into western Europe and was the foremost scholar of the revival of learning known as the Carolingian Renaissance. He also made important reforms in the Roman Catholic liturgy, prepared an important new edition of the Vulgate Bible, wrote a number of poems, and left more than 300 Latin letters, a valuable source for the history of his time. Although traditionally identified as the author of the Caroline books and as the creator of Carolingian miniscule, Alcuin is now recognized as having played a less important role in the creation of both. He was also an important political adviser and confidant of Charlemagne.

aldehyde Any of a class of organic compounds that contain a carbonyl group (— C=0; see functional group) in which the carbon atom is

bonded to at least one hydrogen atom. Many have characteristic odours. Oxidation (see oxidation-reduction) of aldehydes yields acids; reduction produces alcohols. They participate in many chemical reactions and readily undergo polymerization into chains containing tens of thousands of the monomer molecule. The combination of aldehydes (e.g., formaldehyde) with other molecules results in several familiar plastics. Many aldehydes are large-scale industrial materials, useful as solvents, monomers, perfume ingredients, and intermediates. Many sugars are aldehydes, as are several natural and synthetic hormones and compounds such as retinal (a derivative of vitamin A, important in vision) and pyridoxal phosphate (a form of vitamin B 6).

Alden, John (b. 1599?, England — d. Sept. 12, 1687, Duxbury, Mass.) British-born American pilgrim. He was hired as a cooper by the London merchants who funded the Mayflower' s expedition to the New World in 1620. Alden signed the Mayflower Compact and held various civic positions in the colony, including assistant to the governor (1623-41, 1650-86). He was mythologized as the first Pilgrim to set foot on Plymouth Rock and as the stand-in for Myles Standish in his suit for Priscilla Mullens' s hand in marriage in the poem "The Courtship of Miles Standish" (1858) by Henry W. Longfellow. Alden in fact married Mullens in 1623.

Louisa May Alcott, portrait by George Healy; in the Louisa May Alcott Memorial Association collection, Concord, Mass.

COURTESY OF LOUISA MAY ALCOTT MEMORIAL ASSOCIATION

alder Any of about 30 species of ornamental shrubs and trees in the genus Alnus, of the birch family, found throughout the Northern Hemisphere and western South America on cool, wet sites. Alders are distinguished from birches by their usually stalked winter buds and by CONES that remain on the branches after the small, winged nutlets are released. Alders have scaly bark, oval leaves that fall without changing colour, and separate male and female flowers (catkins) borne on the same tree. Some familiar North American alders are the red alder (A. rubra or A. oregona); the white, or

Sierra, alder (A. rhombifoliaf and the speckled alder (A. rugosa). Alder wood is fine-textured and durable, even under water; it is useful for furniture, cabinetry, and lathe work and in charcoal manufacture and millwork. Alders' spreading root systems and tolerance of moist soils lend them to planting on stream banks for flood and erosion control.

Alder (Alnus glutinosa)

EARL L. KUBIS-ROOT RESOURCES

Aldrich, Nelson W(ilmarth) (b. Nov. 6, 1841, Foster, R.I., U.S. — d. April 16, 1915, New York, N.Y.) U.S. senator and financier. He served in the U.S. House of Representatives (1879-81) and the Senate (1881-191 1). His work as chair of the National Monetary Commission (1908-12)

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helped prepare the way for the Federal Reserve System (1913). He also invested profitably in banking, electricity, gas, rubber, and sugar.

Aldrich V61-drich\, Robert (b. Aug. 9, 1918, Cranston, R.I., U.S. — d. Dec. 5, 1983, Los Angeles, Calif.) U.S. film director and producer. He held various jobs at RKO from 1941, working under such directors as Jean Renoir and Charlie Chaplin. After directing his first feature film, The Big Leaguer (1953), he formed his own production company and earned a reputation for socially conscious yet often violent films, including Apache (1954), Kiss Me Deadly (1955), What Ever Happened to Baby Jane? (1962), and The Dirty Dozen (1967).

Aldrich Vol-drichV, Thomas Bailey (b. Nov. 11, 1836, Portsmouth, N.H., U.S. — d. March 19, 1907, Boston, Mass.) U.S. poet, short-story writer, and editor. Aldrich left school at age 13 and soon began to contribute to newspapers and magazines. He was editor of The Atlantic Monthly 1881-90. He drew on his childhood for his classic children's novel The Story of a Bad Boy (1870). His use of the surprise ending influenced the development of the short story in the U.S. Aldrich's poems reflect New England culture and his experiences visiting Europe.

Aldrin Vol-dronX, Edwin Eugene, Jr. known as Buzz Aldrin (b.

Jan. 20, 1930, Montclair, N.J., U.S.) U.S. astronaut. He graduated from West Point and flew 66 combat missions in the Korean War. In 1963 he received a Ph.D. from MIT and was chosen as an astronaut. In 1966 he joined James A. Lovell, Jr. (b. 1928) on the four-day Gemini 12 flight. Aldrin' s 5 Vi-hour walk in space proved that humans can function effectively in the vacuum and weightlessness of space. In July 1969, on the Apollo 1 1 mission, he became the second human to walk on the Moon.

ale Fermented malt beverage, full-bodied and somewhat bitter, with strong flavour of hops. Until the 17th century it was an unhopped brew of yeast, water, and malt, beer being the same brew with hops added. Modern ale (now largely synonymous with beer) is made with top-fermenting yeast and processed at higher temperatures than lager beer. Pale ale has up to 5% alcohol content; the darker strong ale contains up to 6.5%.

Alea \a-'la-3\, Tomas Gutierrez (b. Dec. 11, 1928, Havana, Cuba — d. April 16, 1996, Havana) Cuban film director. After earning a law degree in Cuba, he studied filmmaking in Rome (1951-53). A supporter of Fidel Castro, he helped develop Cuba's film industry after 1959 and made the Communist regime's first official feature film, Stories of the Revolution (1960). Later he worked within the restrictions of the regime to satirize and explore various aspects of life in postrevolutionary Cuba in such internationally acclaimed films as Death of a Bureaucrat (1966), Memories of Underdevelopment (1968), The Survivors (1978), and Strawberry and Chocolate (1993). He is regarded as the finest director Cuba has produced.

aleatory Va-le-s-.tor-eN music (from Latin, alea : "dice game") Any 20th-century music, particularly that of the 1950s and '60s, the composition or performance of which incorporates elements of chance. In aleatory music aspects such as the ordering of a piece's sections, its rhythms, and even its pitches are decided at the moment of performance. When not purely improvising, players follow lists of arbitrary rules or interpreted "graphic" notation that merely suggest the sounds. Charles Ives and Henry Cowell had used such techniques, but John Cage became the principal figure in aleatory; other aleatory composers include Earle Brown (1926-2002), Morton Feldman (1926-87), and Pierre Boulez.

Aleichem, Sholem See Sholem Aleichem

Aleixandre \,a-la-'san-dra\, Vicente (b. April 26, 1898, Sevilla, Spain — d. Dec. 14, 1984, Madrid) Spanish poet. A member of the group of Spanish writers known as the Generation of 1927, he was strongly influenced by Surrealism. His first major book, Destruction or Love (1935), won the National Prize for Literature. Other works include Historia del corazon (1954), En un vasto dominio (1962), and Dialogos del conocimiento (1974). He received the Nobel Prize for Literature in 1977.

Aleksandrovsk See Zaporizhzhya

Alekseyev \3-lyi-'ksya-yif\, Vasiliy (b. Jan. 7, 1942, Pokrovo-Shishkino, Russia, U.S.S.R.) Soviet weight lifter. A superheavyweight, he broke 80 world records between 1970 and 1978 and won Olympic gold medals in 1972 and 1976. He was the first man ever to lift more than 500 lbs (227 kg) in the clean and jerk. He retired after failing to win a third gold medal in the 1980 Olympics.

Aleman \,a-la-'man\, Mateo (baptized Sept. 28, 1547, Sevilla, Spain — d. c. 1614, Mexico) Spanish novelist. Descended from Jews who had been forcibly converted to Roman Catholicism, he expressed many aspects of the experiences and feelings of the New Christians in 16th-century Spain. His most important literary work is Guzman de Alfarache (1599, 1604), one of the earliest picaresque novels, which brought him fame throughout Europe but little profit.

Alembert \a-la n -'ber\, Jean Le Rond d' (b. Nov. 17, 1717, Paris, France — d. Oct. 29, 1783, Paris) French mathematician, scientist, philosopher, and writer. In 1743 he published a treatise on dynamics containing "d'Alembert's principle," relating to Isaac Newton's laws of motion. He developed partial differential equations and published findings of his research on integral calculus. He was associated with the Encyclopedie of

Denis Diderot from c. 1746 as editor of its mathematical and scientific articles; he contributed articles on music as well, and he also published treatises on acoustics. He was elected to the Academie Fran^aise in 1754.

Alentejo \a-la n n-'ta-zhu\ formerly Alemtejo Historical province, Portugal. Lying southeast of the Tagus River, it borders Spain and the Atlantic Ocean. The region produces two-thirds of the world's cork. Until the Portuguese revolution of 1974, Alentejo contained vast estates, mostly owned by absentee landlords; many have since been divided among the Alentejanos.

alenu \a-'la-nii\ (Hebrew: "it is our duty") Opening words of a Jewish prayer recited at the end of the three periods of daily prayer since the Middle Ages. The first section is a prayer of thanks for Israel's being chosen for God's service; the second expresses hope for the coming messianic age. Though traditionally ascribed to Joshua, it is often credited to Abba Arika, a Jewish scholar in Babylonia in the 3rd century ad.

Aleppo \9-'le-po\ Arabic Halab \'ha-lab\ City (pop., 2004 est.: 1,975,200), northwestern Syria. Syria's largest city, it is about 30 mi (48 km) from the Turkish border. Lying at the crossroads of great commercial routes, it has long been inhabited and is first mentioned at the end of the 3rd millennium bc. It subsequently came under the control of many kingdoms, including the Hittites (17th— 14th centuries bc). Controlled by the Persian Achaemenian dynasty in the 6th-4th centuries bc, it soon came under the control of the Hellenistic Seleucid dynasty, under which it was renamed Beroea. It was absorbed into the Roman Empire in the 1st century bc and it prospered for several centuries. In ad 637 it was conquered by the Arabs, under whom it reverted to its old name, Halab. The city successfully defended itself from the Crusaders (1124), fell to the Mongols (1260), and finally was incorporated into the Ottoman Empire (1516). Modem Aleppo is an industrial and intellectual centre rivaling the Syrian capital, Damascus. Its historic structures were designated a UNESCO World Heritage site in 1986.

Alessandri Palma ya-la-'san-dre-'pal-maN, Arturo (b. Dec. 20, 1868, Longavi, Chile — d. Aug. 24, 1950, Santiago) President of Chile (1920-25, 1932-38). He was the son of an Italian immigrant, and his election in 1920 represented the urban classes' first successful challenge to Chile's oligarchy. When he defended workers' groups and attempted liberal reforms, he encountered stiff opposition in Congress. A coup led by Carlos IbAnez forced him into exile, but he was soon recalled and drafted a new constitution that increased the president's power. He became president again in 1932 during the Great Depression, dependent for support on the political right. His declaration of a state of siege in response to widespread strikes cost him his labour and middle-class support.

Alessandro de' Medici See Alessandro de' Medici

Aleut \,a -le-'iit\ Any native of the Aleutian Islands and western portion of the Alaska Peninsula. The name Aleut, used in 1745 by Russian fur traders from the Kamchatka Peninsula, refers primarily to the people of the Aleutian Islands, who call themselves Unangan or Unangas, but also by extension to the Pacific Yupik, who call themselves Alutiit (plural of Alutiiq), an adaptation of the Russian name. Aleuts speak two main dialects and are physically and culturally closely related to the Eskimo. Traditional Aleut villages were located on the seashore near fresh water, where the people hunted marine mammals, fish, birds, caribou, and bear.

Aleut women wove fine grass basketry; stone, bone, and ivory were also worked. After the arrival of the Russians in the 18th century, their population declined drastically. Some 6,600 people claimed sole Aleut ancestry in the 2000 U.S. census.

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Aleutian \9-Tu-sh9n\ Islands Chain of small islands, Alaska, U.S. They form a border of the Bering Sea, extending in an arc about 1,100 mi (1,800 km) west from the tip of the Alaska Peninsula to Attu Island. The major island groups, from east to west, are the Fox Islands (including Unimak and Unalaska), Islands of the Four Mountains, Andreanof Islands (including Adak), and Near Islands (including Attu). The main settlements are on Unalaska and Adak. Originally inhabited by Aleuts, the islands were explored by Russian-sponsored ships in 1741. As Siberian fur hunters moved eastward through the islands, the Russians gained a foothold in North America but nearly caused the extinction of the Aleuts. Russia sold the islands, with the rest of Alaska, to the U.S. in 1867.

alewife Important North American food fish (Pomolobus , or Alosa, pseudoharengus) of the herring family. The alewife grows to about 1 ft (30 cm). Most populations spend several years along North America’s Atlantic coast before ascending freshwater streams to spawn each spring in ponds or sluggish rivers.

Alexander, Harold (Rupert Leofric George) Alexander, 1 st Earl (b. Dec. 10, 1891, London, Eng. — d. June 16, 1969, Slough, Buckinghamshire) British field marshal in World War II. In 1940 he helped direct the Dunkirk evacuation and was the last man to leave the beaches. Appointed British commander in chief in the Mediterranean theatre in 1942, he helped lead the North Africa Campaign against the Germans. He directed the invasions of Sicily and Italy, then became commander in chief of Allied forces in Italy. After the war, he served as governor-general of Canada (1946-52) and as Britain’s minister of defense (1952-54).

Alexander, Severus See Severus Alexander

Alexander, William See William Alexander, 1st earl of Stirling

Alexander I Russian Aleksandr Pavlovich (b. Dec. 23, 1777, St. Petersburg, Russia — d. Dec. 1, 1825, Taganrog) Tsar of Russia (1801—25). He became tsar in 1801 after the assassination of his father, Paul I. He and his advisers corrected many of the injustices of the preceding reign but failed to carry out the abolition of serfdom. During the Napoleonic Wars he alternately fought and befriended Napoleon and helped form the coalition that finally defeated him. Alexander also participated in the Congress of Vienna (1814-15) and formed the Holy Alliance (1815). After his sudden death in 1825, a legend sprang up that he had simply “departed” to a Siberian retreat.

Alexander I (b. Dec. 4, 1888, Cetinje, Montenegro — d. Oct. 9, 1934,

Marseille, France) King of Yugoslavia (1921-34). After commanding Serbian forces in World War I, Alexander succeeded his father, Peter I, as king of the Kingdom of Serbs, Croats, and Slovenes in 1921. In 1929 he abolished the constitution and established a royal dictatorship. As part of his efforts to unify his subjects, he changed the name of the country to Yugoslavia; outlawed political parties based on ethnic, religious, or regional distinctions; reorganized the state; and standardized legal systems, school curricula, and national holidays. In 1934 he was assassinated by an agent of Croatian separatists.

Alexander II Russian Aleksandr Nikolayevich (b. April 29, 1818, Moscow, Russia — d. March 13, 1881, St. Petersburg) Tsar of Russia (1855-81). He succeeded to the throne at the height of the Crimean War, which revealed Russia's backwardness on the world stage. In response, he undertook drastic reform, improving communications, government, and education, and most importantly, emancipating the serfs (1861). His reforms reduced class privilege and fostered humanitarian progress and economic development. Though sometimes described as a liberal, Alexander was in reality a firm upholder of autocratic principles, and an assassination attempt in 1866 strengthened his commitment to conservatism. A period of repression after 1866 led to a resurgence of revolutionary terrorism, and in 1881 he was killed in a plot sponsored by the terrorist organization People's Will.

Alexander II (b. Aug. 24, 1198, Haddington, Lothian — d. July 8, 1249, Kerrera Island) King of Scotland (1214 — 49). He came to the throne on the death of his father, William I (the Lion). In 1215 he supported the rebellious English barons against King John, hoping to regain land in northern England. After the rebellion collapsed (1217), he did homage to Henry III and in 1221 married Henry's sister, Joan. He consolidated royal authority in Scotland and subdued Argyll in 1222. In 1237 he concluded the Peace of York with Henry by which he abandoned his claim to land in England and received in exchange several English estates.

Alexander III See Alexander the Great

Alexander III orig. Rolando Bandinelli (b. c. 1105, Siena, Tuscany — d. Aug. 30, 1181, Rome) Pope (1159-81). A member of the group of cardinals who feared the growing strength of the Holy Roman Empire, he helped draw up an alliance with the Normans (1156). As the representative of Pope Adrian IV, he angered Frederick I (Frederick Barbarossa) by referring to the empire as a "benefice," implying that it was a gift of the pope. On Alexander's election as pope in 1159, a minority of cardinals supported by Frederick elected the first of several antipopes, and imperial opposition obliged Alexander to flee to France (1162). A vigorous defender of papal authority, he supported St. Thomas Becket against Henry II of England. He returned to Rome in 1165 but was exiled again the following year. He gained support with the formation of the Lombard League, which defeated Frederick at Legnano in 1176, paving the way for the Peace of Venice and the end of the papal schism. Alexander stood in the reform tradition and presided at the third Lateran Council (1179).

Alexander III Russian Aleksandr Aleksandrovich (b. March 10, 1845, St. Petersburg, Russia — d. Nov. 1, 1894, Livadiya, Crimea) Tsar of Russia (1881-94). He assumed the throne after the assassination of his father, Alexander II. The internal reforms he instituted were designed to correct what he saw as the too-liberal tendencies of his father's reign. He

thus opposed representative government and ardently supported Russian nationalism. His political ideal was a nation containing a single nationality, language, religion, and form of administration, and accordingly he instituted programs such as the Russification of national minorities in the Russian Empire and the persecution of non-Orthodox religious groups.

Alexander III (b. Sept. 2, 1241 — d. March 18/19, 1286, near Kinghorn, Fife, Scot.) King of Scotland (1249-86). Son of Alexander II, he came to the throne at age 7. In 125 1 he was married to Margaret, daughter of England's King Henry III, who sought to gain control over Scotland. In 1255 Alexander was seized by a pro-English party in Scotland; in 1257 the anti-English party gained control of the government until he came of age (1262). In 1263 he repulsed a Norwegian invasion, and in 1266 he acquired the Hebrides and the Isle of Man from Norway. His reign was later viewed as a golden age by Scots caught up in the long conflict with England.

Alexander VI orig. Rodrigo de Borja y Dorns (b. 1431, Jativa, Aragon — d. Aug. 18, 1503, Rome)

Pope (1492-1503). Bom into the Spanish branch of the Borgia family, he amassed great wealth and lived scandalously, fathering four illegitimate children (before his election as pope), who played an important role in his complicated dynastic plans. He warred against the Ottoman Turks and forced the French to abandon their effort to seize Naples. The murder of his son Juan (1497) prompted Alexander's short-lived attempt to restrain the corruption of the papal court. His political ambitions, however, were revived with the marriage of his son Cesare, whose military campaigns brought northern Italy under Borgia control. He concluded an alliance with Spain and negotiated the Treaty of Tordesillas (1494). A patron of the arts, he embellished the Vatican palaces and commissioned Michelangelo to draw up plans for the rebuilding of St. Peter's Basilica.

Alexander Archipelago Group of about 1,100 islands, southeastern Alaska, U.S. Extending southward from Glacier Bay, the chief islands are Chichagof, Admiralty, Baranof, Kupreanof, Prince of Wales, and Revillagigedo. The chief towns are Sitka (on Baranof) and Ketchikan (on Revillagigedo). The islands are separated from the mainland by deep, narrow channels that form part of the Inside Passage. The archipelago's name, given in 1867, honours Tsar Alexander II.

Alexander Island Island in Bellingshausen Sea, separated from the Antarctic mainland by George VI Sound. An extremely rugged region with peaks as high as 9,800 ft (3,000 m), it is 270 mi (435 km) long and up to 125 mi (200 km) wide, with an area of 16,700 sq mi (43,250 sq km). The Russian explorer F.G. von Bellingshausen discovered the land in 1821 and named it after Tsar Alexander. It was believed part of the

Alexander VI, detail of a fresco by Pinturicchio, 1492-94; in the Vatican.

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mainland until 1940, when a U.S. expedition proved it to be an island, connected to the continent by a huge floating ice shelf. It has been claimed by Britain (since 1908), Chile (1940), and Argentina (1942).

Alexander Nevsky \'nev-ske\, Saint (b. c. 1220, Vladimir, Grand Principality of Vladimir — d. Nov. 14, 1263, Gorodets) Prince of Novgorod (1236-52) and Kiev (1246-52) and grand prince of Vladimir (1252-63). He fought off invading Swedes in 1240 at the Neva River (resulting in the epithet Nevsky). He was called back to service to defeat the Teutonic Knights in 1242 and also won victories over the Lithuanians and Finns. He collaborated with the Golden Horde in imposing Mongol rule on Russia, and the Great Khan made him grand prince of Vladimir. Alexander continued to rule Novgorod through his son. He helped the Mongols impose taxes, interceding with the Khan to prevent reprisals when rebellions broke out. A national hero, he was canonized by the Russian Orthodox church.

Alexander the Great or Alexander III (b. 356 bc, Pella, Macedonia — d. June 13, 323 bc, Babylon) King of Macedonia (336-323) and the greatest military leader of antiquity. The son of Philip II of Macedonia, he was taught by Aristotle. He soon showed military brilliance, helping win the Battle of Chaeronea at age 18. He succeeded his assassinated father in 336 and promptly took Thessaly and Thrace; he brutally razed Thebes except for its temples and the house of Pindar. Such destruction was to be his standard method, and other Greek states submitted meekly. In 334 he crossed to Persia and defeated a Persian army at the Granicus River. He is said to have cut the Gordian knot in Phrygia (333), by which act, according to legend, he was destined to rule all Asia. At the Battle of Issus in 333, he defeated another army, this one led by the Persian king Darius III, who managed to escape. He then took Syria and Phoenicia, cutting off the Persian fleet from its ports. In 332 he completed a seven-month siege of Tyre, considered his greatest military achievement, and then took Egypt. There he received the pharaohs’ double crown, founded Alexandria, and visited the oracle of the god Amon, the basis of his claim to divinity. In control of the eastern Mediterranean coast, in 33 1 he defeated Darius in a decisive battle at Gaugamela, though Darius again escaped. He next took the province of Babylon. He burnt Xerxes' palace at Persepolis, Persia, in 330, and he envisioned an empire ruled jointly by Macedonians and Persians. He continued eastward, quashing real or imagined conspiracies among his men and taking control to the Oxus and Jaxartes rivers, founding cities (most named Alexandria) to hold the territory. Conquering what is now Tajikistan, he married the princess Roxana and embraced Persian absolutism, adopting Persian dress and enforcing Per-

sian court customs. By 326 he reached the Hyphasis in India, where his weary men mutinied; he turned back, marching and pillaging down the Indus, and reached Susa with much loss of life. He continued to promote his unpopular policy of racial fusion, a seeming attempt to form a Persian-Macedonian master race. When his favourite, Hephaestion (324), died, Alexander gave him a hero's funeral and demanded that divine honours be given at his own funeral. He fell ill at Babylon after long feasting and drinking and died at age 33. He was buried in Alexandria, Egypt. His empire, the greatest that had existed to that time, extended from Thrace to Egypt and from Greece to the Indus valley.

Alexanderson, Ernst F(rederik) W(erner) (b. Jan. 25, 1878, Uppsala, Swed. — d. May 14, 1975, Schenectady, N.Y., U.S.) Swedish-born U.S. electrical engineer and television pioneer. He emigrated to the U.S. in 1901 and spent most of the next five decades at General Electric; from 1952 he worked for RCA. He developed a high-frequency alternator that was capable of producing continuous radio waves, revolutionizing radio communication. His completed alternator (1906) greatly improved transoceanic communication and firmly established the use of wireless devices in shipping and warfare. He also developed a sophisticated control system (1916) used to automate intricate manufacturing processes and operate antiaircraft guns. He was awarded his 321st patent in 1955 for the colour TV receiver he developed for RCA.

Alexandra Russian Aleksandra Fyodorovna orig. Alix, Princess von Hesse-Darmstadt (b. June 6, 1872, Darmstadt, German Empire — d. July 16/17, 1918, Yekaterinburg, Russia) Consort of Russia's Tsar Nicholas II. A granddaughter of Queen Victoria, she married Nicholas in 1894 and sought to restore absolute power in the monarchy. Desperate to help her hemophiliac son, Alexis, she turned to the hypnotic powers of Grigory Rasputin, who became her spiritual adviser. In 1915 Nicholas left Moscow to command Russian forces in World War I, and Alexandra dismissed capable ministers and replaced them with nonenities favored by Rasputin. Her misrule contributed to the collapse of the imperial government. After the Bolshevik takeover in the Russian Revolution of 1917, the royal family was imprisoned and later executed.

Alexandria Arabic Al-lskandarlyah City (metro, area pop., 2004 est.: 3,755,900) and chief seaport, northern Egypt. It lies on a strip of land between the Mediterranean Sea and Lake Mareotis. The ancient island of Pharos, whose lighthouse was one of the Seven Wonders of the World, is now a peninsula connected to the mainland. Alexandria's modem harbour is west of the peninsula. The city was founded in 332 bc by Alexander the Great and was noted as a centre of Hellenistic culture. Its library (destroyed early centuries ad) was the greatest in ancient times; a new library was opened in 2002. The city was captured by the Arabs in ad 642 and by the Ottoman Empire in 1517. After a long period of decline, caused by the rise of Cairo, Alexandria was revived commercially when Muhammad 'AlT joined it by a canal to the Nile River in the early 19th century. Modem Alexandria is a thriving commercial community; cotton is its chief export, and important oil fields lie nearby. Other cultural institutions include the Museum of Alexandria.

Alexandria City (pop., 2000: 128,283), northern Virginia, U.S., on the Potomac River. The site was settled in the late 17th century, and in 1749 it was named for John Alexander, the land's original grantee. It was part

of Washington, D.C., from 1801 to 1847, after which it was ceded back to Virginia. Many colonial buildings survive in Alexandria's Old Town; George Washington's estate, Mount Vernon, is nearby.

Alexandria, Library of Most famous library of classical antiquity. It was part of the Alexandrian Museum, a research institute at Alexandria, Egypt. The museum and library were founded and maintained by a succession of Ptolemies from the early 3rd century bc. The library aspired to the ideal of an international library — incorporating all Greek literature and also translations into Greek — but it is uncertain how close this ideal came to being realized. A bibliography of the library compiled by Callimachus, lost in the Byzantine period, was long a standard reference work. The museum and library were destroyed in civil war in the late 3rd century ad; a subsidiary library was destroyed by Christians in ad 391.

Alexandria, Museum of Ancient centre of Classical learning at Alexandria, Egypt. It was a research institute, organized into faculties and headed by a president-priest, with a renowned library. It was built near the royal palace either by Ptolemy II Philadelphus c. 280 bc or by his father, Ptolemy I Soter. The best surviving description is by Strabo. In ad 270 its buildings were destroyed, although its educational and research functions seem to have continued until the 5 th century.

Alexandrina \ l a-lig- l zan- l dre-no\. Lake Lagoon, southeastern South Australia. The lake covers 220 sq mi (570 sq km) and is about 23 mi (37 km) long and 13 mi (21 km) wide. With Lake Albert and the Coorong lagoon, it forms the mouth of the Murray River. In 1830 the explorer Charles Sturt named the lake after Princess Alexandrina (later Queen Victoria). Five barrages built in the 1940s across the lake's exits prevent the intrusion of seawater upstream, allowing for the development of irrigated agriculture in that area.

alexandrine X.al-ek-'zan-dronN Verse form that is the most popular measure in French poetry. It consists of a line of 12 syllables with a pause after the sixth syllable, major stresses on the sixth and the last syllable, and one secondary accent in each half line. It is a flexible form, adaptable to a wide range of subjects. It became the preeminent French verse form for dramatic and narrative poetry in the 17th century and reached its highest development in the tragedies of Pierre Corneille and Jean Racine.

Alexandrists Italian Renaissance philosophers, led by Pietro Pomponazzi (1462-1525), who followed the explanation of Aristotle's De anima given by Alexander of Aphrodisias (2nd-3rd century ad). Alexander held that De anima denied individual immortality, considering the soul a material and therefore a mortal entity, organically connected with the body. The Alexandrists disagreed with Thomas Aquinas and his followers, who interpreted Aristotle as saying that the individual soul is immortal, and with the Latin Averroists (see Averroes), who held that the individual intellect is reabsorbed after death into the eternal intellect.

Alexis Russian Aleksey Mikhaylovich (b. March 9, 1629, Moscow, Russia — d. Jan. 29, 1676, Moscow) Tsar of Russia (1645-76). Son of Michael, the first Romanov monarch of Russia, Alexis acceded to the throne at age 16. He encouraged trade with the West, which brought an upsurge in foreign influences. During his reign the peasants were enserfed.

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the land assemblies fell into gradual disuse, the professional bureaucracy and regular army grew in importance, and patriarch Nikon’s reforms of the Russian Orthodox church were adopted. Though reportedly warm-hearted and popular, Alexis was a weak ruler who sometimes entrusted matters of state to incompetent favourites.

Alexius I Comnenus \kam-'ne-n9s\ (b. 1048, Constantinople — d. Aug. 15, 1118) Byzantine emperor (1081-1118). An experienced military leader, he seized the Byzantine throne in 1081, driving back the invading Normans and Turks and founding the Comnenian dynasty.

Alexius increased Byzantine strength in Anatolia and in the eastern Mediterranean but failed to curb the power of the landed magnates who had divided the empire in the past. He protected the Eastern Orthodox church but did not hesitate to seize its assets when in financial need. His appeal for Western support in 1095 was a factor in Pope Urban II’ s call for the First Crusade. Alexius’s relations with the Crusaders were difficult, and from 1097 onward the Crusades frustrated his foreign policy.

Alexius V Ducas Mourtzouphlus \thu-kas-'murt-su-fl6s\

(d. 1204, Constantinople) Byzantine emperor. In 1204 he led a Greek revolt against his coemperors Isaac II and Alexius IV, who had been supported by the Fourth Crusade, and he became the last Greek emperor of united Byzantium before its overthrow and partition by the Crusaders.

He imprisoned Alexius IV and demanded the Crusaders leave Constantinople, but they instead besieged the city. He fled to join the fugitive Alexius III (his father-in-law), who, instead of allying with him, had him blinded. Captured by the Crusaders, he was thrown from the top of a column to his death.

alfalfa Perennial, CLOVER-like legume (Medicago sativa). It is widely

grown primarily for hay, pasturage, and silage. It is known for its tolerance of drought, heat, and cold, and for its improvement of soil by nitrification (see nitrifying bacteria) due to bacteria associated with its roots. The plant, which grows 1-3 ft (30-90 cm) tall, develops numerous stems that arise from a much-branched crown at soil level, each bearing many three-leaved leaflets. Its long primary root — as long as 50 ft (15 m) in some plants — accounts for its unusual ability to tolerate drought. Its remarkable capacity for regeneration of dense growths of new stems and leaves following cutting makes possible as many as 13 crops of hay in one growing season. Alfalfa hay is very nutritious and palatable, high in protein, minerals, and vitamins.

Alfasi \al-'fa-se\, Isaac ben Jacob (b. 1013, near Fes, Mor. — d. 1103, Lucena, Spain) Moroccan Jewish scholar. He spent most of his life in Fes, but in 1088 he was denounced to the government and was obliged to flee to Spain. He became head of the Jewish community in Lucena and established a noted Talmudic academy, provoking a rebirth of Talmudic study in Spain. His codification of the Talmud, Sefer ha-Halakhot (“Book of Laws”), deals with Halakhah (Hebrew law) and ranks with the works of Maimonides and Karo. It was crucial in establishing the primacy of the Babylonian Talmud over the Palestinian Talmud.

Alferov, Zhores (Ivanovich) (b. March 15, 1930, Vitebsk, Belorussia, U.S.S.R.) Soviet physicist. He received a Ph.D. from the A.F. Ioffe Physico-Technical Institute in 1970 and became director of the institute in 1987. With a research team, he developed the first practical heterostructure electronic device in 1966 and went on to pioneer electronic components made from heterostructures, including the first heterostructure laser. His work led to great advances in communications technology. In 2000 he shared the Nobel Prize for Physics with Herbert Kroemer and Jack S. Kilby.

Alfieri \al-'fya-re\, Vittorio, Count (b. Jan. 16, 1749, Asti, Piedmont — d. Oct. 8, 1803, Florence) Italian tragic poet and playwright. Through his lyrics and dramas he helped revive the national spirit of Italy. After a period of travel in which he experienced English political liberty and read the works of Montesquieu and other French writers, he left the military and began writing. His tragedies almost always present the struggle between a champion of liberty and a tyrant. Of the 19 tragedies that he approved for publication in an edition of 1787-89, the best are Filippo, Antigone, Oreste, Mirra, and his masterpiece, Saul, often considered the most powerful drama in the Italian theatre. His autobiography (1804) is his chief prose work.

Alfonsm \al-fon-'sen\ (Foulkes), Raul (Ricardo) (b. March 13, 1926/7, Chascomus, Buenos Aires, Arg.) Civilian president of Argentina (1983-89). He took a degree in law and founded a newspaper before entering politics in 1953. After Argentina lost the Falkland Islands War, the discredited military permitted free elections, and Alfonsm defeated the Peronist candidate. He prosecuted members of the armed forces for human rights violations, but military pressure (including several armed revolts) led him to pardon most convicted officers. His presidency was plagued by high inflation, a huge national debt, labour disputes, and a discontented military. Constitutionally barred from a second term, he was succeeded by Carlos Menem.

Alfonso I (Portugal) See Afonso I
Alfonso III (Portugal) See Afonso III

Alfonso V known as Alfonso the Magnanimous (b. 1396 — d. June 27, 1458, Naples) King of Aragon (1416-58) and of Naples (as Alfonso I, 1442-58). He followed a policy of Mediterranean expansion, pacifying Sardinia and Sicily and attacking Corsica (1420). Taken prisoner by the Genoese (1435) while preparing to attack Naples, he persuaded his captors into an alliance and conquered Naples (1442), to which he transferred his court. He engaged in much diplomatic and military activity in Africa, the Balkans, and the eastern Mediterranean in order to protect his commerce with the East and defend Christendom against the Turks. He died during an assault on Genoa.

Alfonso VI known as Alfonso the Brave (b. before June 1040 — d. 1109, Toledo, Castile) King of Leon (1065-70) and of Castile and Leon (1072-1109). He inherited Leon from his father, Ferdinand I, and warred with his envious brother Sancho II. On Sancho's death he inherited Castile (1072); he also occupied Galicia and imprisoned his brother Garcia, its rightful ruler. In 1077 Alfonso proclaimed himself emperor of all Spain. He took Toledo from the Muslims, but his demands for tribute led to the invasion of Spain by the North African Almoravids, and he was defeated at Zallaqah (1086). The ClD became an ally and defended eastern Spain, but Alfonso continued to lose ground against the Berber armies.

Alfonso X known as Alfonso the Wise (b. Nov. 23, 1221, Burgos, Castile — d. April, 2, 1284, Sevilla) King of Castile and Leon (1252-84). He crushed revolts by Muslims (1252) and nobles (1254), and he annexed Murcia after repelling an invasion by Morocco, Granada, and Murcia (1264). He claimed the title of Holy Roman emperor (1256), but Gregory X persuaded him to renounce the claim. His second son became his successor as Sancho IV. Alfonso's court was a center of culture, producing an influential law code, the Siete Partidas, and establishing the form of modern Castilian Spanish.

Alfonso XII (b. Nov. 28, 1857, Madrid, Spain — d. Nov. 25, 1885, Madrid) Spanish king whose reign (1874-85) inspired hopes for a stable constitutional monarchy. Alfonso followed his mother, Isabella II, into exile following her deposition by the revolution of 1868. He was proclaimed king in 1874 and returned to Spain the next year. His reign was marked by unaccustomed tranquillity. The most urgent problems — ending the civil war with the Carlists (see Carlism) and drafting a constitution — were settled in 1876. Alfonso was popular, and his early death from tuberculosis disappointed those who desired a constitutional monarchy.

Alfonso XIII (b. May 17, 1886, Madrid, Spain — d. Feb. 28, 1941, Rome, Italy) Spanish king (1886-1931). The posthumous son of Alfonso XII, he was immediately proclaimed king under his mother's regency and assumed full authority at 16. He relished power, and after World War I

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he moved toward a system of more personal rule, even seeking to rid himself of the Cortes (parliament). He associated himself with the dictatorship of Miguel Primo de Rivera (1923-30), but after the latter’s fall the freely elected Republicans demanded Alfonso’s abdication, and he was forced to leave Spain. His grandson became Spain’s sovereign as Juan Carlos I in 1975.

Alfred known as Alfred the Great (b. 849— d. 899) King of Wessex (871-99) in southwestern England. He joined his brother Ethelred 1 in confronting a Danish army in Mercia (868). Succeeding his brother as king, Alfred fought the Danes in Wessex in 871 and again in 878, when he was the only West Saxon leader to refuse to submit to their authority and was driven from the kingdom to the island of Athelney. He defeated the Danes at the Battle of Edington (878) and saved Kent from another Danish invasion in 885. The next year he took the offensive and captured London, a success that brought all the English not under Danish rule to accept him as king. The conquest of the Danelaw by his successors was enabled by his strategy, which included the construction of forts and a naval fleet and the reformation of the army. Alfred drew up an important code of laws (see Anglo-Saxon law) and promoted literacy and learning, personally translating Latin works by Boethius, Pope Gregory I, and St. Augustine of Hippo into Anglo-Saxon. The compilation of the Anglo-Saxon Chronicle was begun under his reign.

algae \'al-je\ Members of a group of mostly aquatic, photosynthetic organisms (see photosynthesis) that defy precise definition. They range in size from the microscopic flagellate Micromonas to giant kelp that reach 200 ft (60 m) in length. Algae provide much of Earth’s oxygen, serve as the food base for almost all aquatic life, and provide foods and industrial products, including petroleum products. Their photosynthetic pigments are more varied than those of plants, and their cells have features not found among plants and animals. The classification of algae is changing rapidly because new taxonomic information is being discovered. Algae were formerly classified into three major groups — the red, brown, and green seaweeds — based on the pigment molecules in their chloroplasts. Many more than three groups are now recognized, each sharing a common set of pigment types. Algae are not closely related to each other in an evolutionary sense. Specific groups can be distinguished from protozoans and fungi (see fungus) only by the presence of chloroplasts and by their ability to carry out photosynthesis; these specific groups thus have a closer evolutionary relationship with the protozoa or fungi than with other algae. Algae are common on “slimy” rocks in streams (see diatoms) and as green sheens on pools and ponds. Use of algae is perhaps as old as humankind; many species are eaten by coastal societies.

Algardi, Alessandro (b. 1595, Bologna, Papal States — d. June 10, 1654, Rome) Italian sculptor. He trained in Bologna under the Carracci family and in 1625 moved to Rome, where he designed the stucco

decorations in San Silvestro al Quirinale. He later became the most outstanding Baroque sculptor in Rome after Gian Lorenzo Bernini. He was a prolific sculptor of portrait busts, and his colossal marble relief of the Meeting of Attila and Pope Leo (1646-53) in St. Peter's Basilica influenced the development and popularity of illusionistic reliefs. His work as a restorer of antique statuary brought him some notoriety.

algebra, linear See linear algebra

algebra and algebraic structures Generalized version of arithmetic that uses variables to stand for unspecified numbers. Its purpose is tO Solve ALGEBRAIC EQUATIONS Or SYSTEMS of equations. Examples of such solutions are the quadratic formula (for solving a quadratic equation) and Gauss- Jordan elimination (for solving a SYSTEM OF EQUATIONS in MATRIX form). In higher mathematics, an "algebra" is a structure consisting of a

class of objects and a set of rules (analogous to addition and multiplication) for combining them. Basic and higher algebraic structures share two essential characteristics: (1) calculations involve a finite number of steps and (2) calculations involve abstract symbols (usually letters) representing more general objects (usually numbers). Higher algebra (also known as modem or abstract algebra) includes all of elementary algebra, as well as group theory, theory of rings, field theory, manifolds, and vector spaces.

algebraic equation Mathematical statement of equality between algebraic expressions. An expression is algebraic if it involves a finite combination of numbers and variables and algebraic operations (addition, subtraction, multiplication, division, raising to a power, and extracting a root). Two important types of such equations are linear equations, in the form y = ax + b, and quadratic equations, in the form y = ax 2 + bx + c. A solution is a numerical value that makes the equation a true statement when substituted for a variable. In some cases it may be found using a formula; in others the equation may be rewritten in simpler form. Algebraic equations are particularly useful for modeling real-life phenomena.

algebraic geometry Study of geometric objects expressed as equations and represented by graphs in a given coordinate system. In contrast to Euclidean geometry, algebraic geometry represents geometric objects using algebraic equations (e.g., a circle of radius r is defined by x 2 + y 2 = r 2). Objects so defined can then be analyzed for symmetries, intercepts, and other properties without having to refer to a graph.

algebraic topology Field of mathematics that uses algebraic structures to study transformations of geometric objects. It uses functions (often called maps in this context) to represent continuous transformations (see topology). Taken together, a set of maps and objects may form

an algebraic group, which can be analyzed by group-theory methods. A well-known topic in algebraic topology is the four-colour map problem.

Algeciras \,al-j9-'sir-9s\ Conference (Jan. 16-April 7, 1906) Conference held at Algeciras, Spain, that resolved the first of the Moroccan crises. In 1905 William II objected to France’s efforts to exert influence in Morocco, prompting a conference of the European powers and the U.S. Superficially, the Act of Algeciras (1 906) seemed to limit French penetration, but the conference’ s real significance was the diplomatic support that Britain and the U.S. gave France, foreshadowing their roles in World War I.

Alger Val-j9r\, Horatio, Jr. (b. Jan. 13, 1832, Chelsea, Mass., U.S. — d. July 18, 1899, Natick, Mass.) U.S. writer. The son of a Unitarian minister, Alger graduated from Harvard with honours and then earned a degree from its divinity school. Forced to leave his pulpit after two years because of allegations of improper activities with youths, he took up writing. Beginning with Ragged Dick (1868), he wrote more than 100 books that were almost alike in preaching that through honesty, cheerful perseverance, and hard work a poor but virtuous lad would have his just reward (though it was almost always precipitated by good luck). His books sold more than 20 million copies, despite consistently weak plots and dialogue, and Alger was one of the most popular and socially influential writers of the late 19th century.

Algeria officially People's Democratic Republic of Algeria

Country, North Africa. Area: 919,595 sq mi (2,381,741 sq km). Population (2005 est.): 32,854,000. Capital: Algiers. Most of the population is ethnically and linguistically Arab, with a large Berber (Amazigh) minority. Languages: Arabic, Berber (both official), French. Religion: Islam (official; predominantly Sunni). Currency: Algerian dinar. Algeria has the second largest land area (after The Sudan) on the continent. The coastline has numerous bays, and the country’s rivers are small and generally seasonal. Northern Algeria is mountainous and is crossed from east to west by the Atlas Mountains; its highest point, elevation 7,638 ft (2,328 m), is Mount Chelia. In central and southern Algeria is much of the northern Sahara. Algeria has a developing economy based primarily on the production and export of petroleum and natural gas. After achieving independence, the country nationalized much of its economy but since the 1980s has privatized parts of the economy. Algeria is a republic with two legislative bodies; its chief of state is the president, and its head of government is the prime minister. Phoenician traders settled there early in the 1st millennium bc; several centuries later the Romans invaded, and by ad 40 they had control of the Mediterranean coast. The fall of Rome in the 5th century led to an invasion by the Vandals and later to a reoccupation by the Byzantine (Eastern Roman) Empire. The Islamic invasion began in the 7th century; by 711 all of northern Africa was under the control of the caliphs of the Umayyad dynasty. Several Islamic Berber empires fol-

"Meeting of Attila and Pope Leo,"
colossal marble relief by Alessandro
Algardi, 1 646-53; in St. Peter's, Rome

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lowed, most prominently the Almoravid (c. 1054-1130), which extended its domain to Spain, and the Almohad (c. 1130-1269). The Barbary Coast pirates menaced Mediterranean trade for centuries; their raids served as a pretext for France to

enter Algeria in 1830. By 1847 France had established military control over most of the region and by the late 19th century had instituted civil rule. Popular protest against French rule resulted in the bloody Algerian War (1954–61); independence was achieved following a referendum in 1962. Beginning in the early 1990s, Islamic fundamentalist opposition to secular rule led to an outbreak in civil violence between the army and various Islamic extremist groups.

Algerian Reformist 'Ulama’ \u-la- , ma\ / Association of Group of Muslim religious scholars founded in 1931 that worked to create an Algerian Muslim identity. The 'Ulama 5 opened schools and promoted the teaching of Arabic. It was opposed by the French-educated elite and the traditional Muslim establishment, which felt threatened by its religious purist tendencies. It joined the National Liberation Front during the war of independence (1954-62) and later had a seat in Algeria’s provisional government. See also Young Algerians.

Algerian War or Algerian War of Independence (1954-62) War for Algerian independence from France. The movement for independence began during World War I (1914-18) and gained momentum after French promises of greater self-rule in Algeria went unfulfilled after World War II (1939-45). In 1954 the National Liberation Front (FLN) began a guerrilla war against France and sought diplomatic recognition at the UN to establish a sovereign Algerian state. Although Algerian fighters operated in the countryside — particularly along the country’s borders — the most serious fighting took place in and around Algiers, where FLN fighters launched a series of violent urban attacks that came to be known as the Battle of Algiers (1956-57). French forces (that increased to 500,000 troops) managed to regain control but only through brutal measures, and the ferocity of the fighting sapped the political will of the French to continue the conflict. In 1959 Charles de Gaulle declared that the Algerians had the right to determine their own future. Despite terrorist acts by French Algerians opposed to independence and an attempted coup in France by elements of the French army, an agreement was signed in 1962, and Algeria became independent. See also Raoul Salan.

Algiers Arabic Al-Jaza’ir French Alger \al-‘zha\ City (pop., 1998: 1,519,570), chief seaport and capital of Algeria. Located along the Bay of Algiers and first settled by Phoenicians, it was later ruled by the Romans. It was destroyed by the Vandals in the 5th century ad but revived under a Berber dynasty in the 10th century. When the Spanish threatened it in the early 16th century, the local emir appealed to the Ottoman corsair Barbarossa, who expelled the Spanish and placed Algiers under the rule of the Ottoman Empire. Algiers became the major base for the Barbary Coast pirates for 300 years; their activities were finally curtailed in 1818 by an American force led by Stephen Decatur. The French took the city in 1830 and made it headquarters for their African colonial empire. In World War II (1939-45), it became the Allied headquarters in northern Africa and for a time the provisional capital of France. In the 1950s it was the focal point in the drive for Algeria’s independence; after independence, Algiers grew as the country’s political, economic, and cultural centre.

ALGOL Val-,g61\ High-level algebraic computer programming language

developed in the late 1950s as an international language for the expression of algorithms (its name is derived from ALGOrithmic Language) between humans as well as between humans and machines. Used especially in mathematical and scientific applications, ALGOL was more popular in Europe than in the U.S., but it was an important precursor of Pascal and it influenced the development of C language.

Algonquian \al-'gan-kwe-on\ languages or Algonkian

\al-'gaq-ke-3n\ languages Family of 25-30 North American Indian languages spoken or formerly spoken across a broad area of eastern and central North America. They are divided conventionally into three geographic groups. Eastern Algonquian languages, spoken from the Gulf of St. Lawrence south to coastal North Carolina, include Micmac, East and West Abenaki, Delaware, Massachusett, and Powhatan (or Virginia Algonquian) — the latter two now long extinct. Central Algonquian languages include Shawnee, Miami-Illinois, Sauk, Kickapoo, Potawatomi, Menominee (all spoken around the Great Lakes), Ojibwa (around the upper Great Lakes and north from eastern Quebec through Manitoba), and Cree-Montagnais-Naskapi (spoken from Labrador west to Hudson Bay and Alberta). Plains Algonquian includes the languages of the Cheyenne, Arapaho, Atsina (Gros Ventres), and Blackfoot (spoken in the central and northern Great Plains).

algorithm Val-go-.ri-thomN Procedure that produces the answer to a question or the solution to a problem in a finite number of steps. An algorithm that produces a yes or no answer is called a decision procedure; one that leads to a solution is a computation procedure. A mathematical formula and the instructions in a computer program are examples of algorithms. Euclid’s Elements (c. 300 bc) contained an algorithm for finding the greatest common divisor of two integers. Manipulation of lists (searching for, inserting, and removing items) can be done efficiently by using algorithms.

algorithms, analysis of Basic computer-science discipline that aids in the development of effective programs. Analysis of algorithms provides proof of the correctness of algorithms, allows for the accurate prediction of program performance, and can be used as a measure of computational complexity. See also Donald Knuth.

Algren Y6l-gron\, Nelson orig. Nelson Ahlgren Abraham (b.

March 28, 1909, Detroit, Mich., U.S. — d. May 9, 1981, Sag Harbor, N.Y.) U.S. writer. The son of a machinist, Algren grew up in Chicago and worked his way through the University of Illinois during the Great Depression. His novels of the poor skillfully capture the mood of the city’s underside and are lifted from routine naturalism by his vision of his characters’ pride, humour, and unquenchable yearnings. Among his popular successes were The Man with the Golden Arm (1949; film, 1956) and A Walk on the Wild Side (1956; film, 1962). He also published an admired short-story collection, The Neon Wilderness (1947).

Alhambra \al-'am-br3\ Palace of the Moorish monarchs of Granada, Spain, built (1238-1358) on a plateau above the city. Its name (Arabic: “the red”) may refer to the colour of the sun-dried bricks used in its outer walls. The Alhambra, only three parts of which remain intact, is made up of a series of rooms and gardens clustered around three principal courts, with extensive use of fountains and water basins. Its surfaces are astound-

ingly ornate and varied, with outstanding examples of stalactite work.

'All (ibn Abl Talib) (b. c. 600, Mecca — d. January 661, Al-Kufah, Iraq) Cousin and son-in-law of the Prophet Muhammad and fourth caliph (656-661). 'All was a ward of Muhammad, just as Muhammad himself had been a ward of 'All's father, Abu Talib. An early convert to Islam, he helped foil an assassination plot against Muhammad and, following the Hijrah to Medina (622), fought beside him against his enemies, gaining renown as a soldier. Since some in the early Muslim community claimed that Muhammad did not name any successor and others claimed that he

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named 'All, the controversy over 'All's claim to the caliphate resulted in the fundamental schism in Islam that eventually led to the creation of the Shl'ite (from shfat 'Ali, "party of 'All") and Sunnite branches of the religion. His willingness to compromise with his adversaries during the first fitnah led some of his troops to desert and form the Kharijite sect, one of whose members later assassinated 'All. In later Islamic hagiography, 'All was held up as the paradigm of youthful chivalry and virtue by both Shl'ites and Sunnites. See also al-HusAYN ibn c Al 1; Battle of Karbala'; Mu'awiyah.

Ali, Muhammad orig. Cassius (Marcellus) Clay (b. Jan. 17, 1942, Louisville, Ken., U.S.) U.S. boxer. Cassius Clay took up boxing at the age of 12 and rose through the amateur ranks to win the Olympic light heavyweight crown in 1960.

His first professional heavyweight title win was against Sonny Liston in 1964. After defending the title nine times between 1965 and 1967, he was stripped of it for refusing induction into the armed forces following his acceptance of the teachings of the Nation of Islam. It was then that he changed his name to Muhammad Ali. In 1974 Ali regained his title after defeating the former champion Joe Frazier and the then-current champion George Foreman. He lost to Leon Spinks in 1978 but later that year regained the title a third time, becoming the first heavyweight champion ever to do so. He retired in 1979, having lost only three of 59 fights. Attempted comebacks in 1980 and 1981 failed. Throughout his career Ali was known for his aggressive charm, invincible attitude, and

colourful boasts, often expressed in doggerel verse. “I am the greatest” was his personal credo. Ali’s later years have been marked by physical decline. Damage to his brain, caused by blows to the head, has resulted in slurred speech, slowed movement, and other symptoms of Parkinson disease.

Alia lemon \al-'yak-mon\ River River, north-central Greece. Rising in the Grammos Mountains and flowing southeast then northeast for 185 mi (297 km) into the upper Gulf of Thermai, it is the longest river in Greek Macedonia. Throughout history it has served as a natural line of defense against invaders from the north.

Alicante \,a-le-'kan-ta\ City (pop., 2001: 284,580), southeastern Spain, located on Alicante Bay of the Mediterranean Sea. It was founded as a Greek colony in 325 bc and was captured in 201 bc by the Romans, who called it Lucentum. After being ruled by the Moors (718-1249), it was later incorporated into the kingdom of Aragon in 1265. The city was besieged by the French in 1709 and by the Federalists of Cartagena in 1873. Its economy is based on tourism and the export of wine and produce.

Alice Springs Town (pop., 2001 prelim.: 26,990), Northern Territory, Australia. It lies between Darwin and Adelaide, virtually in the centre of the continent. It originated in the 1870s as a station on the Overland Telegraph Line. Because of its location, it has become a major shipping point. Its mild winter climate makes it a popular tourist destination.

alien In law, one who resides in a country without becoming naturalized, retaining instead the citizenship of another country. The laws of most nations have long afforded aliens certain minimum standards of civilized treatment but have also restricted their employment and ownership of property. Under U.S. law, all aliens have had to register since 1940. Registration cards (“green cards”) entitle them to obtain employment. Like citizens, aliens are protected by the U.S. Constitution, including the Bill of Rights and the due-process clause of the 14th Amendment. They remain subject to limitations under local laws, and residence in the U.S. is not a right but a privilege granted by Congress.

Alien and Sedition Acts Four laws passed by the U.S. Congress in 1798, in anticipation of war with France. The acts, precipitated by the XYZ Affair, restricted aliens and curtailed press criticism of the government. Aimed at French and Irish immigrants (who were mostly pro-France), they increased the waiting period for naturalization and authorized expulsion of aliens considered dangerous. The Alien and Sedition Acts were opposed by Thomas Jefferson and helped propel him to the presidency. They were repealed or had expired by 1802.

alienation In the social sciences context, the state of feeling estranged or separated from one’s milieu, work, products of work, or self. The concept appears implicitly or explicitly in the works of Emile Durkheim, Ferdinand Tonnies, Max Weber, and Georg Simmel but is most famously associated with Karl Marx, who spoke of workers being alienated from their work and its products under capitalism. In other contexts the term alienation, like anomie, can suggest a sense of powerlessness, meaninglessness, normlessness, social isolation, or cultural- or self-estrangement brought on by the lack of fit between individual needs or expectations and

the social order.

alimentary canal or digestive tract Pathway along which food travels when it is eaten and from which solid wastes are expelled. It includes the mouth, pharynx, esophagus, stomach, small intestine, large intestine, and anal canal. See also digestion.

alimony See marriage law

Alitalia Italian international airline with headquarters in Rome. Although the airline no longer commands monopoly status in its country, as of 2002 the Italian government still owned a majority share of the company.

Alito, Samuel A., Jr. in full Samuel Anthony Alito, Jr. (b. April 1, 1950, Trenton, N.J., U.S.) U.S. jurist. He earned a bachelor's degree (1972) from Princeton University and law degree (1975) from Yale University. He served as an assistant to the U.S. solicitor general (1981-85), deputy assistant to the U.S. attorney general (1985-87), and U.S. attorney for the district of New Jersey (1987-90). In 1990 he was appointed by U.S. Pres. George Bush to serve as a judge on the U.S. Court of Appeals for the Third Circuit, establishing a conservative judicial record. In 2005 he was appointed associate justice of the U.S. Supreme Court by Pres. George W. Bush to fill the seat of retiring justice Sandra Day O'Connor; he was confirmed by the U.S. Senate the following year.

aliyah \a-Te-ya\ Hebrew "ascending" In Judaism, the honour, accorded to a worshiper, of being called up to read an assigned passage from the Torah at Sabbath morning services; or Jewish immigration to Israel. Because the passage assigned for each Sabbath morning service is subdivided into a minimum of seven sections, at least seven different persons are called up for these readings. Aliyah in the sense of immigration to Israel is ongoing but also occurs in waves. The first two waves of immigration occurred in 1882-1914, the next three in 1919-39. The sixth aliyah (1945-48) brought many Holocaust survivors. Later waves of immigration included Falasha from Ethiopia, emigres from the former Soviet Union, and others. See also Zionism.

Alkaios See Alcaeus

alkali Val-ko-.llV Inorganic compound, any soluble hydroxide (— OH) of the alkali metals: lithium, sodium, potassium, rubidium, and cesium. More broadly, ammonium hydroxide (see ammonia) and soluble hydroxides of the alkaline earth metals are also called alkalies. Strong bases that turn litmus paper blue, they react with acids to yield salts, are caustic, and in concentrated form corrode tissues. Sodium hydroxide (caustic soda) and potassium hydroxide (caustic potash) are very important industrial chemicals, used in the manufacture of soaps, glass, and many other products. The mineral trona, a compound of sodium carbonate and bicarbonate, is one naturally occurring alkali. It may be mined or recovered from dry lake beds.

alkali feldspar Any of several common silicate minerals that often occur as whitish to variously coloured, glassy crystals. The alkali feldspars may be regarded as mixtures of sodium aluminosilicate (NaAlSi 3 0 8) and potassium aluminosilicate (KAlSi 3 O g). Both the sodium and potassium aluminosilicates have several distinct forms, each with a different structure. Alkali feldspars are used in the manufacture of glass and ceram-

ics; transparent, highly coloured, or iridescent varieties are sometimes used as gemstones. They are primarily important, however, as constituents of rocks (see plagioclase).

alkali metal Any of the six chemical elements in the leftmost group of the periodic table (lithium, sodium, potassium, rubidium, cesium, and francium). They form alkalies when they combine with other elements. Because their

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atoms have only one electron in the outermost shell, they are very reactive chemically (they react rapidly, even violently, with water), form numerous compounds, and are never found free in nature.

alkaline earth metal Any of the six chemical elements in the second leftmost group of the periodic table (beryllium, magnesium, calcium, strontium, barium, and radium). Their name harks back to medieval alchemy. Their atoms have two electrons in the outermost shell, so they react readily, form numerous compounds, and are never found free in nature.

alkaloid Basic (see base) organic compounds of plant origin, containing combined nitrogen. Alkaloids are amines, so their names usually end in “ine” (e.g., caffeine, nicotine, morphine, quinine). Most have complex chemical structures of multiple ring systems. They have diverse, important physiological effects on humans and other animals, but their functions in the plants that produce them are poorly understood. Some plants (e.g., opium poppy, ergot fungus) produce many different alkaloids, but most produce only one or a few. Certain plant families, including the poppy family (Papaveraceae) and the nightshade family (Solanaceae), are particularly rich in them. Alkaloids are extracted by dissolving the plant in dilute acid.

Alkamenes See Alcamenes

alkane or paraffin Any of a class of hydrocarbons whose molecules consist only of carbon and hydrogen atoms joined by single covalent bonds (general formula C„H (2n + 2 >)- The simplest is methane (CH 4). Alkanes with more than three carbon atoms may have straight and branched isomers. Cycloalkanes have ring structures (but are not aromatic compounds) with two fewer hydrogen atoms per molecule than the corresponding alkane; many have more than one ring. Commercial sources include petroleum and natural gas. Uses, often as mixtures, include fuels, solvents, and raw materials. See also paraffin.

alkene See olefin

All Saints' Day In Christianity, a day commemorating all the saints of the church, known and unknown. It is celebrated on November 1 in the Western churches and on the first Sunday after Pentecost in the Eastern churches. The first general observance of All Saints’ Day was ordered by Pope Gregory IV in 837. In medieval England the festival was called All

Hallows, and its eve is still known as Halloween.

All Souls' Day In the Roman Catholic church, a day commemorating all the Christians believed to be in purgatory. Celebrated on November 2, it was first established by Odilo (d. 1049), abbot of Cluny, in the 11th century, and it was widely celebrated by the 13th century. The date follows All Saints' Day, with the idea that remembering the saints in heaven should be followed by remembering the souls awaiting release from purgatory. Roman Catholic doctrine holds that the prayers of the faithful on earth will help cleanse these souls in order to prepare them for heaven.

Allah Arabic "God" Standard Arabic word for God, used by Arab Christians as well as by Muslims. According to the Qur’an, Allah is the creator and judge of humankind, omnipotent, compassionate, and merciful. The Muslim profession of faith affirms that there is no deity but God and emphasizes that he is inherently one: “nothing is like unto him.” Everything that happens occurs by his commandment; submission to God is the basis of Isiam. The Qur’an and the Hadith contain the 99 “most beautiful names” of God, including the One and Only, the Living One, the Real Truth, the Hearer, the Seer, the Benefactor, and the Constant Forgiven

Allahabad Va-la-ha-,bad\ ancient Prayag City (pop., 2001: metro, area, 1,042,229), south-central Uttar Pradesh state, northern India, on the Ganges (Ganga) and Yamuna rivers. An ancient holy city sacred to Hindu pilgrims, it is the site of the Pillar of Ashoka (erected c. 240 bc). The Mughal emperor Akbar founded the present-day city in 1583; it was ceded to the British in 1801. Allahabad was the scene of a serious outbreak in the 1857 Indian Mutiny. As the home of the Nehru family, it was later a centre of the Indian independence movement. It is the site of the Jami Masjid (Great Mosque) and the University of Allahabad.

Allbutt, Sir Thomas Clifford (b. July 20, 1836, Dewsbury, Yorkshire, Eng. — d. Feb. 22, 1925, Cambridge, Cambridgeshire) English physician. He introduced the modern clinical thermometer (the thermometer had previously been a foot-long instrument that required 20 minutes to register temperature) and outlined the use of the ophthalmoscope to inspect the interior of the eye. He demonstrated the aortic origin of angina pectoris. His investigations improved treatment of arterial diseases and

resulted in, among other works, Diseases of the Arteries (1915). His chief publication was Systems of Medicine (8 vol., 1896-99).

Alleghenian orogeny V.al-o-'ga-ne-on-o-'ra-jo-neN formerly Appalachian Revolution Mountain-building event that affected the Appalachian Geosyncline in the late Permian period (c. 286-248 million years ago). The Alleghenian orogeny is most pronounced in the central and southern Appalachian Mountains and produced the different effects in various subregions: compressional folding and faulting of the Valley and Ridge Province, westward thrusting of the Blue Ridge, and folding and minor metamorphism and igneous intrusion in the Piedmont Province. It may have resulted from the collision (see plate tectonics) of the central and southern Appalachian continental margin with that of North Africa in the Permian period.

Allegheny \,al-3-'ga-ne\ Mountains Ranges of the Appalachian system in Pennsylvania, Maryland, Virginia, and West Virginia, U.S., west

of and generally parallel to the Blue Ridge Mountains. Part of the Allegheny Plateau that spans the entire upland area from the Cumberland Plateau to the Mohawk Valley in New York, the Allegheny Mountains extend some 500 mi (800 km) south-southwestward, with heights of more than 4,800 ft (1,460 m). The eastern slope is sometimes called the Allegheny Front.

Allegheny River River in Pennsylvania and New York, U.S. It rises in Potter county. Pa., loops northwest into New York, turns back into Pennsylvania, and unites with the Monongahela to form the Ohio River at Pittsburgh, Pa. It is 325 mi (523 km) long; its chief tributaries are the Clarion, the Kiskiminetas, and French Creek. Several dams make the river navigable from Pittsburgh to East Brady, Pa.

allegory Work of written, oral, or visual expression that uses symbolic figures, objects, and actions to convey truths or generalizations about human conduct or experience. It encompasses such forms as the fable and parable. Characters often personify abstract concepts or types, and the action of the narrative usually stands for something not explicitly stated. Symbolic allegories, in which characters may also have an identity apart from the message they convey, have frequently been used to represent political and historical situations and have long been popular as vehicles for satire. Edmund Spenser’s long poem The Faerie Queen is a famous example of a symbolic allegory.

allele \3-'lel\ Any one of two or more alternative forms of a gene that may occur alternatively at a given site on a chromosome. Alleles may occur in pairs, or there may be multiple alleles affecting the expression of a particular trait. If paired alleles are the same, the organism is said to be homozygous for that trait; if they are different, the organism is heterozygous. A dominant allele will override the traits of a recessive allele in a heterozygous pairing (see dominance and recessiveness). In some traits, alleles may be codominant (i.e., neither acts as dominant or recessive). An individual cannot possess more than two alleles for a given trait. All genetic traits are the result of the interactions of alleles.

allemande Val-o-.mandX Processional couple dance with stately flowing steps, fashionable in the 16th century, especially in France. A line of couples extended their paired hands forward and paraded back and forth the length of the ballroom. It was revived in the 18th century as a figure dance for four couples, in which each pair performed intricate turns under each other’s arms, a figure that partly survives in the “allemand” of the U.S. square dance. In the late 17th century a stylized version of the dance in % time began to be used by composers as the first movement of the SUITE.

Allen, Ethan (b. Jan. 21, 1738, Litchfield, Conn. — d. Feb. 12, 1789, Burlington, Vt., U.S.) American soldier and frontiersman. After fighting in the French and Indian War (1754-63), he settled in what is now Vermont. At the outbreak of the American Revolution, his force of Green Mountain Boys (organized in 1770) helped defeat the British in the Battle of Ticonderoga (1775). As a volunteer with troops commanded by Gen. Philip Schuyler, he attempted to take Montreal but was captured by the British and held prisoner until 1778. He returned to Vermont, where he worked for statehood. Failing to achieve this, he attempted to negotiate the annexation of Vermont to Canada.

Allen, Mel orig. Melvin Allen Israel (b. Feb. 14, 1913, Birming-

ham, Ala., U.S. — d. June 16, 1996, Greenwich, Conn.) U.S. sports broadcaster. As lead announcer for the New York Yankees baseball team (1940-64), he was known for his congeniality and his catchphrase “How about

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that!” He hosted the television program This Week in Baseball (1977-95). In 1978 Allen and Red Barber became the first broadcasters elected to the Baseball Hall of Fame.

Allen, Richard (b. Feb. 14, 1760, Philadelphia, Pa. — d. March 26, 1831, Philadelphia) U.S. religious leader. He was born to slave parents, and his family was sold to a Delaware farmer. A Methodist convert at 17, he was licensed to preach five years later. By 1786 he had purchased his freedom and settled in Philadelphia, where he joined St. George’s Methodist Episcopal Church. Racial discrimination prompted him to withdraw in 1787, and he turned an old blacksmith shop into the first black church in the U.S. Allen and his followers built the Bethel African Methodist Church, and in 1799 he was ordained as its minister. In 1816 he organized a conference of black leaders to form the African Methodist Episcopal Church, of which he was named the first bishop.

Allen, Steve orig. Stephen Valentine Patrick William Allen

(b. Dec. 26, 1921, New York, N.Y., U.S.— d. Oct. 30, 2000, Encino, Calif.) U.S. entertainer and songwriter. He appeared as a comedian on radio in the 1940s before moving to late-night television, where he created and hosted The Tonight Show (1954-57) and The Steve Allen Show (1956—60). He hosted several other television shows, including Meeting of Minds (1977-81). He composed over 3,000 songs, including “Picnic” and “Impossible,” and appeared in films such as The Benny Goodman Story (1955).

Allen, Woody orig. Allen Stewart Konigsberg (b. Dec. 1, 1935, Brooklyn, N.Y., U.S.) U.S. film director, screenwriter, and actor. After writing routines for comedians and performing as a nightclub comic, he wrote the Broadway play Don’t Drink the Water (1966). His early films, such as Bananas (1971) and Sleeper (1973), combined highbrow comedy and slapstick. Later romantic comedies such as Annie Hall (1977), which won him two Academy Awards, and Manhattan (1979) offered a bittersweet view of New York life. He continued making films into the 21st century, most notably Hannah and Her Sisters (1986), Crimes and Misdemeanors (1989), and Bullets over Broadway (1994).

Allenby (of Megiddo and of Felixstowe), Edmund Henry Hynman Allenby, 1st Viscount (b. April 23, 1861, Brackenhurst, near Southwell, Nottinghamshire, Eng. — d. May 14, 1936, London) British field marshal. He fought in the South African War and served as inspector general of cavalry (1910-14). In World War I, he commanded with distinction in the Middle East. His victory over the Turks at Gaza

(1917) led to the capture of Jerusalem, and his victory at Megiddo, along with his capture of Damascus and Aleppo, ended Ottoman power in Syria. His success was partly due to his innovative use of cavalry and other mobile forces, and he is remembered as the last great British leader of mounted cavalry. As high commissioner for Egypt (1919-25), he steered that country to recognition as a sovereign state (1922).

Allende \a-'yen-da\ (Gossens), Salvador (b. July 26, 1908, Valparaiso, Chile — d. Sept. 11, 1973, Santiago) Socialist president of Chile (1970-73). Of upper-middle-class background, Allende took a degree in medicine and in 1933 helped found Chile's Socialist Party. He ran for president unsuccessfully three times before winning narrowly in 1970. He attempted to restructure Chilean society along socialist lines while retaining democracy, civil liberties, and due process of law, but his efforts to redistribute wealth resulted in stagnant production, food shortages, rising inflation, and widespread strikes. His inability to control his radical supporters further alienated the middle class. His policies dried up foreign credit and led to a covert campaign by the U.S. Central Intelligence Agency to destabilize the government. He was overthrown in a violent military coup, during which he died by gunshot, reportedly self-inflicted. He was replaced by Gen. Augusto Pinochet. See also Eduardo Frei.

Allentown City (pop., 2000: 106,632), eastern Pennsylvania, U.S. It was laid out along the Lehigh River in 1762 and named Northampton by William Allen, later the state's chief justice; its name was changed in 1838 to honour Allen. During the American Revolution, the Liberty Bell was moved there for safekeeping. It is a major iron and mining centre.

allergy Exaggerated reaction by the body to foreign substances that are harmless to most people. Those substances, called allergens or antigens, may include pollens, drugs, dusts, foods, and other items. Immediate allergic reactions result from genetic predisposition or sensitization by previous exposure. Blood vessels dilate and bronchial air passages constrict. A severe reaction (anaphylaxis) can obstruct breathing and may be fatal.

Delayed allergic responses (e.g., contact dermatitis) appear 12 hours or more after exposure. Avoiding allergens and taking antihistamines can prevent or treat allergies. When avoidance is not feasible and antihistamines do not relieve symptoms, desensitization can be attempted.

alliance In international politics, a union for joint action of various powers or states. Examples include the alliance of the European powers and the U.S. against Germany and its allies during World War II and the alliance of the NATO states against the Soviet Union and its allies during the Cold War. Many alliances rest on the principle of collective security, through which an attack on one member is considered an attack on all members. Major alliances formed after World War II include the ANZUS Pact, the Arab League, ASEAN, the Organization of American States, the Southeast Asia Treaty Organization, and the Warsaw Pact.

Alliance for Progress International development program. Initiated by the U.S. and joined by 22 Latin American countries in 1961, it aimed to strengthen democratic government and promote social and economic reforms in Latin America. The program, which provided loans and aid from the U.S. and the international financial community, built some schools and hospitals, but by the early 1970s it was widely viewed as a failure. Significant land reform was not achieved, population growth out-

stripped gains in health and welfare, and the U.S. willingness to support military dictators to prevent communism from gaining a foothold sowed distrust and undermined the reforms the Alliance was intended to promote.

Alliance Israelite Universelle Xal-'yaVis-ra-el-'et-ie-ne-ver-'seH Political organization founded in France in 1860 for the purpose of providing assistance to Jews. Its founders were a group of French Jews who had the resources to help those who were poor, offering political support, helping individuals emigrate, and eventually setting up Jewish education programs in eastern Europe, the Middle East, and North Africa. In 1945 it expressed support for political Zionism (the establishment of a Jewish state), and in 1946 its diplomatic activities were taken over by the Consultative Council of Jewish Organizations in New York City.

Allied Powers or Allies Nations allied in opposition to the Central Powers in World War I or to the Axis Powers in World War II. The original Allies in World War I — the British Empire, France, and the Russian Empire — were later joined by many other countries, including Portugal, Japan, and Italy. Other nations joining the Allies, including the U.S. after 1917, were called Associated Powers, a term emphasized by Pres. Woodrow Wilson to preserve the U.S.’s free hand in the war. In World War II the major Allied Powers were Britain, France, the Soviet Union, the U.S., and China. More generally, the Allies included all the wartime members of the United Nations, the 1942 signatories to the Declaration of the UN.

alligator Either of two species of long-snouted reptiles constituting the genus Alligator (family Alligatoridae, order Crocodilia). Alligators differ from crocodiles in snout shape and tooth placement. Living in large bodies of water such as lakes, swamps, and rivers, these lizardlike carnivores use their powerful tail for defense and swimming. The eyes, ears, and nostrils, located on top of the long head, project above the water’s surface. Alligators dig burrows in which they shelter from danger and hibernate in cold weather. The once-endangered American alligator of the southeastern U.S. may grow to 19 ft (5.7 m) long but usually ranges from 6 to 12 ft (1.8 to 3.7 m) long. The Chinese alligator of the Chang (Yangtze) River region, which grows to 5 ft (1.5 m), is critically endangered.

Alligator (Alligator mississippiensis)

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Allingham Val-iq-oirA, Margery (Louise) (b. May 20, 1904, London, Eng. — d. June 30, 1966, Colchester, Essex) British detective-story writer. She published her first story at age 8, her first novel at 19, and her first detective story in her early 20s. Her stories about the fictional detective Albert Campion became very popular, and such novels as Tiger in the

Smoke (1952) and The China Governess (1962), with their intellectual style and psychological insight, helped win detective fiction consideration as a serious literary genre. The BBC produced adaptations of eight of her novels in the late 1980s.

alliteration or head rhyme Repetition of consonant sounds in two or more neighbouring words or syllables. A frequently used poetic device, it is often discussed with assonance (the repetition of stressed vowel sounds within two or more words with different end consonants) and consonance (the repetition of end or medial consonants).

allium Any plant of a large genus (Allium) of bulbous, onion- or garlic-scented herbs of the lily family, including the onion, garlic, chive, leek, and shallot. Allium species are found in most regions of the world except the tropics and New Zealand and Australia. Some are cultivated as ornamental border plants.

allocation of resources Apportionment of productive assets among different uses. The issue of resource allocation arises as societies seek to balance limited resources (capital, labour, land) against the various and often unlimited wants of their members. Mechanisms of resource allocation include the price system in free-market economies and government planning, either in state-run economies or in the public sectors of mixed economies. The aim is always to allocate resources in such a way as to obtain the maximum possible output from a given combination of resources.

Allosaurus X.al-o-'sor-osV Large carnivorous dinosaur of a group similar to the tyrannosaurs, found as fossils primarily in Late Jurassic rocks of North America. It weighed 2 tons (1,800 kg) and grew to 35 ft (10.5 m) long. Its well-developed tail, half of its total body length, probably functioned as a counterbalance for the body. Allosaurus walked on its two hind limbs and probably used the much smaller forelimbs for grasping. Equipped with powerful, flexible jaws, allosaurs likely preyed on medium-sized dinosaurs; they were possibly scavengers that hunted in groups. Some related allosaurs (Giganotosaurus , Carcharodonotosaurus) may have been larger than Tyrannosaurus rex.

allosteric control \,a-lo- , ster-ik\ Inhibition or activation of an enzyme by a small regulatory molecule that interacts with the enzyme at a site (allosteric site) other than the active site (at which catalytic activity occurs). The interaction changes the shape of the enzyme, thus affecting the active site of the usual complex between the enzyme and its substrate (the substance on which the enzyme acts). As a result, the enzyme’s ability to catalyze a reaction (see catalysis) is either inhibited or enhanced. If the regulatory molecule inhibits an enzyme in the pathway of its own synthesis, the control is said to be feedback inhibition. Allosteric control enables the cell to regulate needed substances rapidly.

allotrope Va-lo-.tropX Any of two or more forms of the same chemical element. They may have different arrangements of atoms in crystals of the solid — for example, graphite and diamond for carbon — or different numbers of atoms in their molecules — for example, ordinary oxygen (0 2) and ozone (0 3). Other elements that have allotropes include tin, sulfur, antimony, ARSENIC, SELENIUM, and PHOSPHORUS.

alloy Metallic substance composed of two or more elements, as either a mixture, compound, or solid solution. The components of alloys are ordi-

narily themselves metals, though carbon is an essential nonmetal component of steel. Alloys are usually produced by melting the mixture of ingredients. The value of alloys was discovered in very ancient times; brass (copper and zinc) and bronze (copper and tin) were especially important. Today the most important are the alloy steels, which have a wide range of special properties, including hardness, toughness, corrosion resistance, magnetizability, and workability.

Allport, Gordon W(illard) (b. Nov. 11, 1897, Montezuma, Ind., U.S. — d. Oct. 9, 1967, Cambridge, Mass.) U.S. psychologist. He taught at Harvard University (1930-67), becoming noted for his theory of personality, which focused on the adult self rather than on childhood or infantile emotions and experiences, set forth in books such as Personality (1937). In The Nature of Prejudice (1954) he made important contributions to the analysis of prejudice.

allspice Tropical evergreen tree (Pimento dioica) of the myrtle family, native to the West Indies and Central America and valued for its berries, the source of a highly aromatic spice.

Allspice was so named because the flavour of the dried berry resembles a combination of cloves, cinnamon, and nutmeg. It is widely used in baking. The name is applied to several other aromatic shrubs as well, including Carolina allspice (Calycanthus floridus), Japanese allspice (Chimonanthus praecox), and wild allspice, or spicebush.

Allston, Washington (b. Nov. 5, 1779, Allston plantation. Brook Green Domain on Waccamaw River, S.C., U.S. — d. July 9, 1843, Cambridgeport, Mass.) U.S. painter and writer. He studied at Harvard University and at London’s Royal Academy (with Benjamin West). He settled in Massachusetts in 1830 and became the most important first-generation U.S. Romantic painter. His large landscapes depict the mysterious and dramatic aspects of nature. He later relied on mood and reverie in smaller, more dreamlike images. He also wrote poetry and fiction, and his theories on art were published posthumously as Lectures on Art (1850).

alluvial deposit Material deposited by rivers. It consists of silt, sand, clay, and gravel, as well as much organic matter. Alluvial deposits are usually most extensive in the lower part of a river’s course, forming floodplains and deltas, but they may form at any point where the river overflows its banks or where the flow of a river is checked. They yield very fertile soils, such as those of the deltas of the Mississippi, Nile, Ganges and Brahmaputra, and Huang (Yellow) rivers. They contain most of the world’s supply of tin ore, as well as, in some regions, gold, platinum, and gemstones.

Almagest Val-mo-jestN Astronomical and mathematical encyclopedia compiled c. ad 140 by Ptolemy. It served as the basic guide for Arab and European astronomers until the 17th century. The name derives from the Arabic for “the greatest.” Its 13 books cover such topics as the geocentric (Earth-centred), or Ptolemaic, model of the solar system; eclipses; the

coordinates and sizes of certain fixed stars; and the distances to the Sun and the Moon.

Almagro \al-'ma-gro\, Diego de (b. 1475, Almagro, Castile — d. 1538, Cuzco, Peru) Spanish soldier who played a leading role in the Spanish conquest of Peru. Following service in the Spanish navy, he arrived in South America in 1524 and, with Francisco Pizarro, led the expedition that conquered the Inca empire in what is now Peru. Bitter enmity arose between the two men, and Almagro imprisoned Pizarro' s two brothers for insubordination during an Indian rebellion. Pizarro then defeated Almagro' s army and had his former friend put to death.

almanac Book or table containing a calendar of a given year, with a record of various astronomical phenomena, often with weather prognostications, seasonal suggestions for farmers, and other information. The first printed almanac appeared in the mid 15th century. Benjamin Franklin began his famous Poor Richard's almanacs in 1732. A form of folk literature, 18th-century almanacs furnished useful and entertaining information where reading matter was scarce; a surviving example is the Old Farmer's Almanac. Modern almanacs are often annual publications containing statistical, tabular, and general information.

Alma-Tadema Val-mo-'ta-do-moV Sir Lawrence (b. Jan. 8, 1836, Dronrijp, Neth. — d. June 25, 1912, Wiesbaden, Ger.) Dutch-British painter. After studies at the Antwerp Academy, he visited Italy (1863) and became enamoured of Greco-Roman antiquity and Egyptian archaeology; the ancient world was to provide his primary themes. After settling in London in 1870, he excelled at the accurate re-creation of ancient scenes, exotic costumes, and the sensuous depiction of beautiful women against backgrounds of marble, bronze, and silk. Such figurative images combined sentimentality and anecdote. He was elected to the Royal Academy in 1879 and knighted in 1899. Alma-Tadema's work was immensely popular in his day, but it went out of favour after his death.

Almaty Xol-'ma-t e\ formerly Alma-Ata Vsl-'ma-o-'taV City (pop., 1999: 1,129,400), southeastern Kazakhstan. Formerly the capital of Kazakhstan, it lost its capital status in 1995 to Aqmola (now Astana). The modern city

Allspice (Pimento diocia)

J.E. CRUISE

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was founded in 1 854, when the Russians established a military fortification on the site of the ancient city of Almaty, destroyed by the Mongols in the 13th century. With the coming of the railroad in 1930, its popula-

tion grew rapidly. In World War II (1939-45), heavy industry expanded widely as factories were evacuated to the site from European Russia. The city remains a major industrial centre.

Almendros \al-'men-dros\, Nestor (b. Oct. 30, 1930, Barcelona, Spain — d. March 4, 1992, New York, N.Y., U.S.) Spanish cinematographer. In 1948 he emigrated from Spain to Cuba, where he worked with documentary filmmakers. After moving to France in 1961, he collaborated with Eric Rohmer on My Night at Maud's (1969) and Claire's Knee (1970), and with Francois Truffaut on The Wild Child (1970). His work in the U.S. includes Sophie's Choice (1982), and Billy Bathgate (1991).

Almohad \'al-mo- I had\ dynasty Arabic al-Muwahhidun ("Unitarians") (1130-1269) Berber confederation born out of religious opposition to the Islamic doctrines of the Almoravid dynasty. The Almohad leader Ibn Tumart began his rebellion in the 1120s. Marrakech was captured in 1147 under the leadership of his successor 'Abd al-Mu'min. By the 1170s all of the Maghrib was under unified control for the only time in its history, and the Almohads also controlled Muslim Spain. Their rule was marked by, on the one hand, the cultivation of science and philosophy and, on the other, efforts at religious unification by compelling Jews and Christians to convert or emigrate. They lost control of Spain to the Christians in 1212 and of their North African provinces to the Hafsid dynasty in Tunis (1236) and the Marinids in Marrakech (1269).

almond Tree (Prunus dulcis) in the rose family, native to South Asia; also its edible seed, or nut. The tree, growing somewhat larger and living longer than the peach, is strikingly beautiful when in flower. The nuts are either sweet or bitter. Sweet almonds are the edible type consumed as nuts and used in cooking. The extracted oil of bitter almonds is used to make flavouring extracts for foods and liqueurs. Almonds provide small amounts of protein, iron, calcium, phosphorus, and B vitamins and are high in fat. They are commonly used in confectionery baking and in marzipan, a traditional European candy.

Almoravid V.al-mo-'ra-vodX dynasty Arabic al-Murabitun (1056-1147) Berber confederation that succeeded the Fajimid dynasty in the Maghrib. It flourished in the 11th and early 12th centuries. Its founder, c Abd Allah ibn Yasln, was a Muslim scholar of the Malik! school who used religious reform as a means of gaining followers in the mid- 11th century. The Almoravids took over Morocco and then the rest of the Maghrib following the decline of the Zlrid dynasty. By 1082 they ruled Algiers. By 1110 they also controlled Muslim Spain, but the Christians began to win back territory in 1118. In the 1120s another Berber coalition, the Almohads, started a rebellion, eventually displacing the Almoravids.

aloe Any shrubby succulent plant of the genus Aloe, in the lily family. Native to Africa, most of the 200 or so species have a rosette of leaves at the base but no stem. Several are cultivated as ornamentals. The juice of some species, especially the popular potted plant known as true aloe (. Aloe vera), is used as an ingredient in cosmetics, as a purgative, and as a treatment for bums.

aloe, American See century plant

Alonso, Alicia orig. Alicia Martinez Hoyo (b. Dec. 21, 1921, Havana, Cuba) Cuban ballerina, choreographer, and director. She studied in Havana and New York, where she danced with Ballet Theatre (later

American Ballet Theatre; 1940-41, 1943^18, 1950-55, 1958-59). In 1948 she formed her own company, Ballet Alicia Alonso (renamed Ballet Nacional de Cuba in 1959), with which she performed frequently on tour in Latin America. Despite failing eyesight, she continued for many years to dance leading roles as a guest artist with American Ballet Theatre and other companies.

alpaca \al-'pa-k3\ South American species (Lama pacos) in the camel family (Camelidae). The alpaca, guanaco, llama, and vicuna are closely related and are known collectively as lamoids. Domesticated several thousand years ago by Indians of the Andes Mountains, the alpaca has a slender body, a long neck and legs, a small head, a short tail, and large, pointed ears. Alpacas stand about 35 in. (90 cm) at the shoulder and weigh 120-145 lbs (54-65 kg). They are found in central and southern Peru and western Bolivia, on marshy ground at high altitudes. They are the most important of the lamoids for wool production.

Alp-Arslan Valp-ar-'slan\ (b. c. 1030 — d. November? 1072/January 1073) Second sultan of the SeljOq dynasty, who added Georgia, Armenia, and much of Anatolia to his domains of Khorasan and western Iran. He preferred conquest to governing and left the administration of his empire to his famous vizier, Nizam al-Mulk. In 1071 his victory over the Byzantine Empire at the Battle of Manzikert opened the door for the eventual Turkish conquest of Anatolia. He died a year later when mortally wounded by a prisoner during a quarrel.

Alpha Centauri Triple star in the constellation Centaurus, the faintest component of which, Proxima Centauri, is currently the closest star to the Sun (about 4.2 light-years away). The two brighter components are about 0.2 light-year farther from the Sun. As seen from Earth, the system is the third brightest star (after Sirius and Canopus); Proxima is indistinguishable as a separate star to the unaided eye. Alpha Centauri can be seen from Earth’s surface only from points south of about 40° N.

alpha decay Type of radioactive disintegration (see radioactivity) in which some unstable atomic nuclei dissipate excess energy by spontaneously ejecting an alpha particle. Alpha particles have two positive charges and a mass of four atomic mass units; they are identical to helium nuclei. Though they are emitted at speeds about one-tenth that of light, they are not very penetrating and have ranges in air of about 1-4 in. (2.5-10 cm). Alpha decay commonly occurs in elements with atomic numbers greater than 83 (bismuth), but can occur in some rare-earth elements in the atomic-number range of 60 (neodymium) to 71 (lutetium). Alpha decay half-lives range from about a microsecond (10 -6 second) to billions of years (10 17 seconds).

alphabet Set of symbols or characters that represent language’s sounds in writing. Each character usually represents a simple vowel, a diphthong (two vowels), or one or two consonants. A writing system in which one character represents a whole syllable is called a syllabary. The first alphabet is believed to have been the North Semitic, which originated in the eastern Mediterranean region between 1700 and 1500 bc. Alphabets that arose in the next 500 years included the Canaanite and Aramaic, from which the modern Hebrew and Arabic alphabets descended, and the Greek (ancestor of the Latin alphabet), considered the first true alphabet because it includes both consonants and vowels. Scholars have attempted to establish an exact correspondence between each sound and its symbol in new

alphabets such as the International Phonetic Alphabet.

Alpheus \al-'fe-3s\ River River, southern Greece. About 75 mi (120 km) long, it is the longest river in the Peloponnese. It rises in Arcadia and flows northwest through southern Elias into the Ionian Sea. Olympia is on its northern bank. It shares its name with the ancient river god, and it figures in Greek legend, including Hercules' cleaning of the Augean stables, and in Samuel Taylor Coleridge's poem "Kubla Khan."

Alpine orogeny \o-'ra-j3-ne\ Mountain-building event that affected a broad segment of southern Europe and the Mediterranean region during the middle Tertiary period. It produced intense metamorphism, crumpling of rock strata, and uplift accompanied by faulting. It was responsible for the elevation of the present Alps, from which the name derives, the uplifting of plateaus in the Balkan Peninsula and in Corsica and Sardinia, and volcanic activity in England, France, Iceland, and parts of Italy.

Alpine skiing Class of competitive ski events consisting of speed events (the downhill and the supergiant slalom) and technical events (the slalom and giant slalom). Speed events are contested in single runs down longer, steeper, faster courses, with fewer turns than those featured in the technical events. Alpine skiing was first included in the Olympic Games in 1936. See also cross-country skiing; Nordic skiing.

Alps Mountain system, south-central Europe. The Alps extend in a crescent about 750 mi (1,200 km) from the Mediterranean coast between France and Italy to Vienna and cover more than 80,000 sq mi (207,000 sq km). Several peaks rise above 10,000 ft (3,000 m); the highest is Mont Blanc. The Alps form a divide between the Atlantic Ocean, the Mediterranean Sea, and the Black Sea and give rise to several major European rivers, including the Rhone, Danube, and Po. Glaciers cover about 1,500 sq mi (3,900 sq km), mostly at elevations above 10,000 ft (3,000 m). The Saint Gotthard Pass is one of the Alps's notable tunnels. Grenoble, Innsbruck, and Bolzano are major Alpine cities.

Alsace-Lorraine \al-'sas-l6-Tan\ Area, eastern France. It is now usually considered to include the present-day French departments of Haut-Rhin, Bas-Rhin, and Moselle. The area was ceded by France to Germany

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in 1871 after the Franco- Prussian War. It was returned to France after World War I, occupied by the Germans in World War II, then again restored to France. French prewar governmental policies that had clashed with the region's particularism have since been modified. The German dialect known as Alsatian remains the lingua franca, and both French and German are taught in the schools.

Alsatian See German shepherd

Altai Mountains Russian Altay \al-'t!\ Chinese Altay Shan

\al-'tl-'shan\ Mongol Altay n Nuruu Mountain system, Central Asia. The range extends about 1,200 mi (2,000 km) in a southeast-northwest direction from the Gobi Desert to the West Siberian Plain, through parts of China, Mongolia, Russia, and Kazakhstan. The highest point is the Russian peak Belukha, 14,783 ft (4,506 m) in elevation. The mountains are the source of the Irtysh and Ob rivers and are notable for their mining and hydroelectrical potential.

Altaic \al-'ta-ik\ languages Group of more than 50 languages, comprising the Turkic, Mongolian, and Manchu-Tungus subfamilies. Altaic languages are spoken across Eurasia by more than 140 million people (the overwhelming majority of whom speak Turkic languages). Most scholars consider Altaic itself to be a family, of proven genetic relationship, though a minority attribute similarities in the languages to borrowings and areal convergence. The Uralic and Altaic language families were once believed to form a superfamily, but reliable sound correspondences have not been demonstrated, and the numerous similarities between the two are now attributed to areal influences.

Altamira ^al-to-'mir-oX Cave near Santander, northern Spain, famous for its magnificent prehistoric paintings and engravings. The paintings, dating to 14,000-12,000 bc, were first described in 1880. Altamira cave is 890 ft (270 m) long. The roof of the main chamber is covered with paintings, chiefly of bison, in vivid red, black, and violet. Other figures, in a simpler style, include wild boars, horses, and a hind, as well as eight engraved anthropomorphic figures and various handprints and hand outlines. Engraved artifacts and other material remains suggest that the site may have been a centre for seasonal gatherings. See also Magdalenian culture; rock art.

Alton \'al-tan\ or Anda \'an-da\ (d. 1583, Mongolia) Mongol khan who terrorized China in the 16th century. He established a Chinese-style government in his homeland and concluded a peace treaty with Ming-dynasty China in 1571. He converted the Mongols to the reformed, or Dge-lugs-pa, sect of Tibetan Buddhism. In 1578 Altan granted the head of the sect the title of Dalai Lama. With Mongol military aid, later Dalai Lamas crushed the more established Karma-pa (Red Hat) sect in Tibet to become Tibet’s spiritual and temporal rulers. See also Gtsang dynasty.

altar Raised structure or place used for sacrifice, worship, or prayer. Altars probably originated with the belief that objects or places (e.g., a tree or spring) were inhabited by spirits or deities worthy of prayers or gifts. Sacrifice to deities required a structure on which the victim could be killed and blood channeled off or flesh burned. In ancient Israel, the altar was a rectangular stone with a hollo wed-out basin on top. The ancient Greeks placed altars (see baetylus) in homes, marketplaces, public buildings, and sacred groves. Roman altars were similarly ubiquitous and were often decorated with relief sculptures. Christians at first did not use altars, but by the 3rd century the table on which the Eucharist was celebrated was regarded as an altar. It became the focus of the mass in Christian churches and in Western churches was often adorned by a baldachin and an ALTARPIECE.

altarpiece Painting, relief, sculpture, screen, or decorated wall standing on or behind an altar in a Christian church. The images depict holy personages, saints, and biblical subjects. There are two types of altarpieces: the reredos, which rises from the floor behind the altar, and the

retable, which stands on the altar itself or on a pedestal behind it. The diptych is an altarpiece consisting of two panels; a triptych, three panels; and a polyptych, four or more panels. Altarpieces vary in size; some are small and portable, some are huge and stationary, and some have movable wings that can be opened and closed. The practice of erecting sculptural altarpieces dates from the 11th century; altar paintings became common in the 14th century.

Altdorfer Valt-.dor-faA, Albrecht (b. c. 1480— d. Feb. 12, 1538, Regensburg) German painter and printmaker. He was the leading artist of the Danube school. Most of his works depict religious subjects, but he was

one of the first artists to develop landscape painting as an independent genre, specializing in sunset lighting and ruins in twilight. His drawings demonstrate these skills in black with white highlights on dark paper. The influence of Albrecht DOrer is evident in his miniature engravings and woodcuts. From 1526 until his death he was town architect of Regensburg; no architectural work of his is known to have survived.

Alte Pinakothek Val-to-.pe-na-ko-'tekX German "Old Museum of

Painting" Art museum, one of several collections within the Bavarian State Picture Galleries in Munich, Germany, and one of the great museums of the world. It specializes in European painting from the Middle Ages through the late 18th century; its core collections once belonged to several early Bavarian electors palatine. The building is a 1957 reconstruction of the original 19th-century gallery, destroyed in World War II. Other state museums include the Neue (“New”) Pinakothek, which is based on the private collections of Bavarian kings and features 1 8th—20th-century European paintings and sculpture; the Schack Gallery collection of late Romantic German painting; and the State Gallery of Modem Art.

alternating current (AC) Flow of electric charge that reverses periodically, unlike direct current. It starts from zero, grows to a maximum, decreases to zero, reverses, reaches a maximum in the opposite direction, returns again to zero, and repeats the cycle indefinitely. The time taken to complete one cycle is called the period (see periodic motion), and the number of cycles per second is the frequency; the maximum value in either direction is the current’s amplitude. Low frequencies (50-60 cycles per second) are used for domestic and commercial power, but frequencies of around 100 million cycles per second (100 megahertz) are used in television and of several thousand megahertz in radar and microwave communication. A major advantage of alternating current is that the voltage can be increased and decreased by a transformer for more efficient transmission over long distances. Direct current cannot use transformers to change voltage. See also electric current.

alternation of generations In biology, alternation of a sexual phase (gametophyte) and a nonsexual phase (sporophyte) in the life cycle of an organism. The two phases, or generations, are often distinct in structure and sometimes in chromosome makeup. Alternation of generations is common in algae, fungi (see fungus), Mosses, ferns, and seed plants. The character and extent of the two phases vary greatly among different groups of plants and algae. During the course of evolution, the gametophyte stage has been progressively reduced. Thus in higher (vascular) plants, the sporophyte is the dominant phase; in more primitive, nonvascular plants

the gametophyte is dominant. Among animals, many invertebrates (e.g., protozoans, jellyfish, flatworms) have an alternation of sexual and asexual generations.

alternative energy Any of various renewable power sources to use in place of fossil fuels and uranium. Fusion devices (see nuclear fusion) are believed by some to be the best long-term option, because their primary energy source would be deuterium, abundant in ordinary water. Other technologies include solar energy, wind power, tidal power, wave power, hydroelectric power, and geothermal energy. The amount of energy in such renewable and virtually pollution-free sources is large in relation to world energy needs, yet at present only a small portion of it can be converted to electric power at reasonable cost.

alternative medicine or complementary medicine Any of a

broad range of healing approaches not used in conventional Western medicine. Many are holistic (see holistic medicine); many also emphasize prevention and education. Alternative therapies include acupuncture, aromatherapy, Ayurveda medicine, Chinese medicine, chiropractic, herbal medicine, homeopathy, massage, meditation, naturopathy, therapeutic touch, and Yoga. Though considered alternative in the West, such medicine is the main source of health care for up to 80% of people in less-developed countries. Some alternative-medicine practices are useless or harmful; others are effective and may offer treatments in areas where conventional approaches have not succeeded (e.g., chronic disorders).

alternator Source of direct electric current in modern vehicles for ignition, lights, fans, and other uses. The electric power is generated by an alternator mechanically coupled to the engine, with a rotor field coil supplied with current through slip rings, and a stator with a three-phase winding. A rectifier converts the power from alternating to direct form. A regulator ensures that the output voltage is properly matched to the bat-

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tery voltage as engine speed varies. An inductor alternator is a special kind of synchronous generator in which both the field and the output winding are on the stator.

bearing assembly

Exploded view of an automotive alternator. The engine's turning crankshaft, connected to the alternator's pulley by a belt, turns the magnetic rotor inside the stationary stator assembly, generating an alternating current. The diode assembly rectifies the alternating current, producing direct current, which is used to meet the demands of the vehicle's electrical system, including recharging the battery.

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Altgeld, John Peter (b. Dec. 30, 1847, Niederselters, Prussia — d. March 12, 1902, Joliet, 111., U.S.) German-bom U.S. politician, governor of Illinois (1893-97). He emigrated from Germany as a child. In the 1870s he moved to Chicago, where he accumulated a small fortune in real estate and became active in Democratic Party politics. In 1892 he won the governorship as a reformist candidate. In 1893, at the urging of Clarence Darrow and labour leaders, he granted clemency to three men convicted of complicity in the Haymarket Riot. The controversial pardon provoked an outcry from conservatives and contributed to his defeat for reelection in 1896, though Altgeld’ s decision later gained wide approval in judicial circles.

altimeter \al-'tim-3t-3r\ Instrument that measures the altitude of the land surface or of any object, such as an airplane. The mechanical pressure altimeter measures atmospheric pressure relative to sea level through a series of bellows, gears, and springs, which move pointers on a dial. Radio altimeters measure the distance of an aircraft above the ground rather than above sea level by indicating the time a pulse of radio energy takes to travel from the aircraft to the ground and back; they are used in automatic navigation and blind-landing systems.

Altiplano \,al-ti-'pla-n6\ Spanish "High Plateau" Region, southeastern Peru and western Bolivia. Comprising a series of intermontane basins, it originates northwest of Lake Titicaca in southern Peru and extends southeast to southwestern Bolivia. The region’s wildlife originally included alpacas and llamas, both now bred for wool. The cities of Puno and Juliaca (Peru) and La Paz (Bolivia) are located in the Lake Titicaca basin, an area that has been populated since ancient times.

altitude and azimuth \'az-math\ Two coordinates describing the position of an object above Earth in a coordinate system called the altazimuth, or horizon, system, and used in astronomy, gunnery, navigation, surveying, and other fields. Altitude in this sense is expressed as angle of elevation (up to 90°) above the horizon. Azimuth, in astronomical measurement, is the number of degrees clockwise from due north to the point on the horizon directly below the object.

altitude sickness or mountain sickness Acute reaction to a change from low altitudes to altitudes above 8,000 ft (2,400 m). Most people gradually adapt, but some have a severe reaction that can be fatal unless they return to low altitude. Normal adaptations to the reduced oxygen at high altitude (e.g., breathlessness, racing heartbeat) are exaggerated; other manifestations include headache, gastrointestinal upsets, and weakness. Pulmonary edema is quickly reversed with oxygen and evacuation to a lower area.

Altman Volt-monV Robert (B.) (b. Feb. 20, 1925, Kansas City, Mo., U.S.) U.S. film director. He learned filmmaking by directing industrial films, then directed several television series before making his first feature film, Countdown (1967). The successful antiwar comedy M*A*S*/7 (1970) established his reputation as an independent director whose work emphasizes character and atmosphere over plot. His most acclaimed films

include McCabe and Mrs. Miller (1971), Nashville (1976), The Player

(1992), and Short Cuts (1993).

Altman, Sidney (b. May 7, 1939, Montreal, Que., Can.) Canadian-born U.S. molecular biologist. He studied at MIT and the University of Colorado and has taught at Yale University since 1971. Working independently, Altman and Thomas Cech discovered that RNA, previously believed to be simply a passive carrier of genetic codes between different parts of the living cell, could also initiate and carry out (i.e., catalyze) some reactions, opening up new fields of research and biotechnology. The two shared a 1989 Nobel Prize.

alto or contralto Voice or register that extends approximately from the F below middle C to the second D above it. The second-highest part in four-part music, it is normally sung by women. The name derives from contratenor altus, the part above the tenor part. It is used for some instruments that play principally in the alto range (alto saxophone, alto flute, etc.). See also countertenor.

Altria Group, Inc. U.S. holding company with interests in tobacco, foods, and financial services. Formerly called Philip Morris Cos., Inc., the group changed its name to Altria in January 2003. Its holdings include Kraft Foods, Inc. (including Nabisco), Philip Morris International Inc., and Philip Morris USA Inc. (see Philip Morris tobacco companies), and an interest in SABMiller PLC, which was created in 2002 from the merger of South African Breweries PLC and Miller Brewing Co. Philip Morris had acquired the Miller Brewing Co. in 1969. It continued to reduce its dependence on tobacco by acquiring General Foods (1985), Kraft Foods (1988), and Nabisco (2000), among others. In 1998, as part of the settlement of a suit brought against it and other cigarette manufacturers by 46 U.S. states, the company agreed to participate in paying more than $200 billion to the states for smoking-related health-care costs.

altruism Ethical theory that regards the good of others as the end of moral action; by extension, the disposition to take the good of others as an end in itself. The term (French, altruisme, derived from Latin alter : “other”) was coined in the 19th century by Auguste Comte and adopted generally as a convenient antithesis to egoism. Most altruists have held that each person has an obligation to further the pleasures and alleviate the pains of other people. The same argument holds if happiness, rather than pleasure, is taken as the end of life.

alum \'a-lom\ Inorganic compound, any of a class of hydrated double salts, usually consisting of aluminum sulfate, water of hydration (an essential part of the crystal makeup), and the sulfate of another element. The most important alums are those of potassium sulfate (potassium alum, or potash alum, ^SO^Al^SO^^T^O), ammonium sulfate, and sodium sulfate. Alums occur naturally in various minerals and can be prepared and purified by crystallization from their solutions. Most are white crystals with an astringent, acid taste. They are used as paper-sizing agents, flocculating agents in water treatment, mordants in dyeing, and in pickles, baking powder, fire extinguishers, and medicines.

aluminum Metallic chemical element, chemical symbol Al, atomic number 13. A lightweight, silvery white metal, it is so reactive chemically that it always occurs in compounds. It is the most abundant metallic element in Earth’s crust, chiefly in bauxite (its principal ore), feldspars, micas, clay minerals, and laterite. It also occurs in gemstones, such as topaz, garnet, and chrysoberyl; emery, corundum, ruby, and sapphire are crystalline alumi-

num oxide. Aluminum was first isolated in 1825, became commercially available in the late 19th century, and is now the most widely used metal after iron. Its surface oxidizes at once to a hard, tough film, deterring further corrosion. Uses include building and construction, corrosion-resistant chemical equipment, auto and aircraft parts, power transmission lines, photoengraving plates, cookware and other consumer goods, and tubes for ointments and pastes. Important compounds include alums; alumina (aluminum oxide), useful as corundum and as a carrier for many catalysts; aluminum chloride, a widely used catalyst for organic syntheses; and aluminum hydroxide, used to waterproof fabrics.

Alvarado \,al-va-'ra-tho\, Pedro de (b. c. 1485, Badajoz, Castile — d. 1541, in or near Guadalajara, New Spain) Spanish soldier and colonial administrator. In 1519 he accompanied the army led by HernAn Cortes that conquered Mexico. In 1522 he became the first mayor of Tenochtitlan (Mexico City). In 1523 he conquered the native peoples of Guatemala and founded the city (modern Antigua) that became the first capital of the Guatemala region, which later included much of Central America.

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He was governor of Guatemala in 1527-31. In 1539 he began an exploration of central Mexico, but died while quelling an Indian uprising.

Alvarez Val-v3- 1 rez\ / Luis W(alter) (b. June 13, 1911, San Francisco, Calif., U.S. — d. Sept. 1, 1988, Berkeley, Calif.) U.S. experimental physicist. He joined the faculty of the University of California at Berkeley in 1936, where he would remain until 1978. In 1938 he discovered that some radioactive elements decay when an orbital electron merges with the atom’s nucleus, producing an element with an atomic number smaller by one, a form of beta decay. In 1939 he and Felix Bloch (1905-83) made the first measurement of the magnetic moment of the neutron. During World War II he developed a radar guidance system for landing aircraft and participated in the Manhattan Project to develop the atomic bomb.

He later helped construct the first proton linear accelerator and constructed the liquid hydrogen bubble chamber. With his son, the geologist Walter Alvarez (b. 1940), he helped develop the theory that links the dinosaurs’ extinction with a giant asteroid or comet impact. For work that included the discovery of many subatomic particles, he received the Nobel Prize for Physics in 1968.

alveolus See pulmonary alveolus

Alzheimer Valts-.hl-msA disease Degenerative brain disorder. It occurs in middle to late adult life, destroying neurons and connections in the cerebral cortex and resulting in significant loss of brain mass. The most common form of dementia, Alzheimer disease progresses from short-term memory impairment to further memory loss; deterioration of language, perceptual, and motor skills; mood instability; and, in advanced stages, unresponsiveness, with loss of mobility and control of body functions; death typically ensues in 5-10 years. Originally described in 1906 by the German neuropathologist Alois Alzheimer (1864-1915) with reference to a 5 5 -year-old person and regarded as a presenile dementia, Alzheimer disease is now recognized as accounting for much of the senile dementia once thought normal with aging. The 10% of cases that begin before age 60 result from an inherited mutation. Neuritic plaques and neurofibrillary tangles in the brain on autopsy are the primary features used for diagnosis. No cure has been found. Most treatment targets the depression, behavioral problems, and sleeplessness that often accompany the disease.

AM in full amplitude modulation Variation of the amplitude of a carrier wave (commonly a radio wave) in correspondence to fluctuations in the audio or video signal being transmitted. AM is the oldest method of broadcasting radio programs. Commercial AM stations operate in the frequency range of 535 to 1605 kHz. Because radio waves of these frequencies are reflected back to the Earth’s surface by the ionosphere, they can be detected by receivers hundreds of miles away. In addition to commercial radio broadcasting, AM is also employed in short-wave radio broadcasts, and in transmitting the video portion of television programs. See also FM.

AMA See American Medical Association

Amadeus V.am-o-'da-osX VI known as Amadeus the Green Count

(b. 1334, Chambery, Savoy [France] — d. March 1, 1383, Castropignano [Italy]) Count of Savoy (1343-83). Ruler of Savoy from age 9, he significantly extended his kingdom’s territory and power. By the 1350s, after adding lands on the Italian side, he held nearly the entire western Alps. He joined a Crusade against the Turks (1366) and restored John V Palaeologus to the Byzantine throne. A mediator of quarrels among Italian powers, he set out to rescue Queen Joan I of Naples from her enemies (1382) but died of plague during the expedition.

Amado \a-'ma-du\, Jorge (b. Aug. 10, 1912, Ferradas, near Ilheus, Braz. — d. Aug. 6, 2001, Salvador, Bahia) Brazilian novelist. Amado was born and reared on a cacao plantation. He published his first novel at age 20. His early works, including The Violent Land (1942), explore the exploitation and suffering of plantation workers. Despite imprisonment and exile for leftist activities, he continued to produce novels, many of

which have been banned in Brazil and Portugal. Later works such as Gabriela, Clove and Cinnamon (1958), Dona Flor and Her Two Husbands (1966), and The War of the Saints (1993) preserve Amado’s political attitude in their more subtle satire; many of his books were adapted for film and television.

Amalfi \a-'mal-fe\ Town (pop., 2000: commune, 5,527), southern Italy,

on the Gulf of Salerno. It was of little importance until the mid-6th century, when it fell under Byzantine control. It grew into one of the first Italian maritime republics in the 9th century, becoming a rival of Venice and Genoa. Annexed by Roger II of Sicily in 1131, it was sacked by Pisa in 1135 and 1137 and rapidly declined in importance, though its maritime code, the Tavola Amalfitana, was recognized in the Mediterranean until 1570. Amalfi is now a notable tourist resort.

amalgam \9-'mal-g9m\ Alloy of mercury and one or more other metals. Those of silver, gold, and palladium occur naturally. Those with a very high mercury content are liquid; others are crystalline. Amalgams of silver and tin, with minor amounts of copper and zinc, are used in dentistry to fill teeth. Sodium amalgam is used in manufacturing chlorine and sodium hydroxide by electrolysis of brine. Amalgams are used to recover silver and gold from their ores: The ore is shaken with mercury, the amalgam is separated and heated until the mercury distills off (see distillation), and the precious metal is the residue. Amalgams are also used to silver mirrors and apply other metal coatings.

Amalric Va-'mal-rik, 'am-3l-rik\ I (b. 1136 — d. July 11, 1174) King of Jerusalem (1163-74). Amalric was a strong ruler who helped break the unity of Muslims surrounding the Holy Land. He passed a law giving vassals the right to appeal to the High Court against unjust treatment by their lords. His invasion of Egypt (1163) led to a war with Nureddin of Syria, which Amalric lost despite help from Manuel I Comnenus. Though the effort to conquer Egypt failed, the Palestinian-Byzantine alliance continued.

Amalric II (b. c. 1155 — d. April 1, 1205) King of Cyprus (1194-1205) and of Jerusalem (1197-1205). Amalric inherited the kingdom of Cyprus on the death of his brother, Guy of Lusignan, and formed a close alliance with the ruler of Palestine. He also became the vassal of Holy Roman Emperor Henry VI. When the ruler of Palestine died, Amalric married his widow and became king of Jerusalem. He administered Jerusalem separately from his other lands and made peace with his Muslim neighbours after Saladin’s death (1193).

amanita \ l am-3-'ne-t3\ Any mushroom of the genus Amanita, containing about 100 species, some of which are poisonous to humans.

Among the deadliest of all mushrooms are the large, white destroying angels (A. bispongera, A. ocreata, A. verna, and A. virosa), which are found in forests during wet periods in summer and autumn. The green or brown death cap (A. phalloides), also deadly, is found in woods in summer or early autumn. The poisonous fly agaric (A. muscaria), found in pastures and fields in summer, was once used as a fly poison. Common edible species include A. caesarea, A. rubescens, and A. vaginata.

Amar Das Vsm-ar-'dasV (b. 1479,

Khadur?, India — d. 1574, Goindwal)

Third Sikh Guru. Much revered for his wisdom and piety, he became Guru at age 73. He was noted for his missionary efforts to spread Sikhism and for the division of the Punjab into 22 dioceses. To strengthen the faith, he ordered three great Sikh festivals each year, and he made the city of Goindwal a centre of Sikh learning. He extended the casteless langar (“free kitchen”) and required that anyone wanting to see him must first eat there. Advocating a middle way between the extremes of asceticism and sensuous pleasure, he purified Sikhism of Hindu practices, encouraged intercaste marriages, allowed widows to remarry, and prohibited suttee (self-immolation of a widow on her husband’s funeral pyre).

Luis Alvarez

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Fly agaric (Amanita muscaria)

LARRY C. MOON -TOM STACK & ASSOCIATES

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amaranth Va-ms-.ranthA family Family Amaranthaceae, which contains about 60 genera and more than 800 species of herbaceous plants and a few shrubs, trees, and vines, native to tropical America and Africa. Globe amaranth (Gomphrena) and cockscomb (Celosia) are cultivated as ornamentals. The large genus Amaranthus contains the ornamentals love-lies-bleeding (A. caudatus) and Joseph’ s-coat (A. tricolor), as well as many weedy plants known as pigweed, especially A. retroflexus. Some Amaranthus species are tumbleweeds, and some are potential high-protein grain crops.

Amaravati \,a-m9-'ra-v9-te\ sculpture Style of sculpture found in the Andhra region of southeastern India. It flourished there from about the 2nd century bc to the end of the 3rd century ad, during the rule of the Satavahana dynasty. Carved in relief on greenish-white limestone, these sculptures depict events in the life of the Buddha. The compositions are dynamic, sensuous, and dramatic, with overlapping figures and diagonals suggesting depth. The style spread from the Amaravati ruins west to Maharashtra Pradesh, to Sri Lanka (Ceylon), and to much of South Asia.

The Amaravati stupa was one of the largest in Buddhist India; it was largely destroyed in the 19th century by building contractors to make lime mortar.

Amarillo City (pop., 2000: 173,627), northern Texas, U.S. The chief city of the Texas Panhandle, it originated in 1887 with the coming of the railroad. After it grew to become one of the world's busiest cattle- shipping sites in the 1890s, agriculture became important in the region. The discovery of petroleum and natural gas in the 1920s further promoted Amarillo's development.

Amarna, Tell el- Ancient city, Egypt. Located midway between Thebes and Memphis on the Nile River, it was built in the 14th century bc by the Egyptian king (pharaoh) Akhenaton, who moved his subjects there in order to found a new monotheistic religion. Artifacts discovered there in the 19th century included hundreds of cuneiform tablets. Archaeological finds of the late 20th century included sculptures and paintings.

amaryllis V.am-o-'ril-osN family Family Amaryllidaceae of the order Liliales, containing about 65 genera and at least 835 species of perennial herbaceous plants, found mostly in tropical and subtropical regions and prized for their showy flowers, which are borne on smooth, hollow stalks with few or no leaves. Many species are cultivated as garden ornamentals. Many tropical lilylike plants also belong to the family, including the genera Haemanthus (Cape tulip, or blood lily), Alstroemeria (Peruvian lily), and Hippeastrum. Some are grown as houseplants.

Amaterasu X.am-o-'ter-o-siA (Omikami) In Shinto, the sun goddess from whom the Japanese royal family traditionally claims descent. She was given domain over heaven while her brother, the storm god Susanoo, was set to rule over the sea. The two produced children together, but Susanoo began to behave rudely and destructively, and Amaterasu withdrew in protest into a cave, plunging the world into darkness. She was lured out by the other gods and goddesses, and a rope was placed over its entrance to prevent her return. Her chief place of worship is the Grand Shrine of Ise, Shinto's most important shrine.

Amati family Family of Italian violin makers in Cremona in the 16th and 17th centuries. Andrea (c. 1520-c. 1578) set the form of the modem violin. His two sons Antonio (c. 1550-1638) and Girolamo (1561-1630) worked together and were known as the brothers Amati. Girolamo's son Nicolo (1596-1684), who like his forebears worked in Cremona, is regarded as the family's finest craftsman. Among his famous pupils were Andrea Guarneri and Antonio Stradivari; Nicolo was succeeded by his son Girolamo (1649-1740). The great contribution of the Amatis to the development of the violin was their evolution of the flat, shallow model, which, as improved by Stradivari, is capable of producing a brilliant soprano tone.

Amazon In Greek mythology, a member of a race of women warriors. One of the labours of Heracles was to obtain the girdle of the Amazon queen Hippolyte. In another tale, Theseus attacked the Amazons, and they responded by invading Attica, where they were defeated; Theseus married the Amazon Antiope. In ancient Greek art, Amazons resembled Athena (with weapons and helmet) and later Artemis (in a thin dress girded high for speed).

Amazon River Portuguese Rio Amazonas River, northern South America. It is the largest river in the world in volume and area of drain-

age basin; only the Nile River of eastern and northeastern Africa exceeds it in length. It originates within 100 mi (160 km) of the Pacific Ocean in the Peruvian Andes Mountains and flows some 4,000 mi (6,400 km) across northern Brazil into the Atlantic Ocean. Its Peruvian length is called the Maranon River; the stretch of river from the Brazilian border to the mouth of the Negro River is the Solimoes River. Its more than 1,000 known tributaries rise in the Guiana Highlands, the Brazilian Highlands, and (principally) the Andes; 7 of these are longer than 1,000 mi (1,600 km), and the Madeira River exceeds 2,000 mi (3,200 km). The Amazon can accommodate large freighters as far upriver as the city of Manaus, Braz., 1,000 mi (1,600 km) from the Atlantic. The first European descent was made by Francisco de Orellana in 1541-42; he is said to have given the river its name after reporting battles with tribes of women, whom he likened to the Amazons of Greek legend. Pedro Teixeira achieved the first ascent in 1637-38, but the river remained little explored until the mid-19th century. Many indigenous peoples originally lived along the river, but they moved inland as exploring parties and raiders (see bandeira) sought to enslave them. The river was opened to world shipping in the mid- 19th century; traffic increased exponentially with the coming of the rubber trade, which reached its height c. 1910 but soon declined. Its basin encompasses the world’s most extensive rainforest and is home to an extraordinary diversity of birds, mammals, and other wildlife. Since the 1960s the effects of economic exploitation on the region’s ecology and the destruction of the rainforest have generated worldwide concern.

Amazonia National Park Park, north-central Brazil, about halfway between the cities of Manaus and Belem, along the Tapajos River. Established in 1974, it has gradually expanded to cover about 3,300 sq mi (8,600 sq km) and contains an immense diversity of flora and fauna.

amban Manchu "minister" Representative of China’s Qing emperor who lived in the territory of a tributary state or dependency. In 1793 the Qing emperor Qianlong changed the procedure for selecting the Dalai Lama, and the Tibetans had to persuade the amban that they had complied. In 1904, when the British were trying to force Tibet to sign a trade treaty, the amban said he was powerless to negotiate for the Tibetans, an admission that called into question the degree of control China exercised over Tibet. The ambans ’ role and authority continues to be debated by the Chinese government and advocates of Tibetan independence in the attempt to support their conflicting claims for Tibet’s status.

ambassador Highest-ranking diplomatic representative of one government to another or to an international organization. As formally defined and recognized at the Congress of Vienna (1815), ambassadors were originally regarded as personal representatives of their country’s chief executive rather than of the whole country, and their rank entitled them to meet personally with the head of state of the host country. Originally, only the principal monarchies exchanged ambassadors; the U.S. did not appoint ambassadors until 1893. Since 1945 all nations have been recognized as equals, and ambassadors or their equivalents are sent to all countries with which diplomatic relations are maintained. Before the development of modern communications, ambassadors were entrusted with extensive powers; they have since been reduced to spokespeople for their foreign offices.

amber Fossil tree resin that occurs as irregular nodules, rods, or drop-

like shapes in all shades of yellow with nuances of orange, brown, and, rarely, red. Milky-white opaque varieties are called bone amber. Hundreds of species of insects and plants are found as fossils in amber. Deeply coloured translucent to transparent amber is prized as gem material, and numerous ornamental carved objects and beads are made from amber. Amber has been found throughout the world, but the largest deposits occur along the shores of the Baltic Sea.

ambergris Vam-bor-.gris, , am-b3r-,gre\ Waxy substance (about 80% cholesterol) formed in the intestine of sperm whales, used chiefly as a spice in the East and for fixing the scent of fine perfumes in the West. It is thought to form as a collection of feces around indigestible parts of squid and other prey of the whale. Fresh ambergris is soft, black, and smelly; exposed to sunlight, air, and seawater, it hardens, fades, and develops a pleasant scent. It may wash ashore or be found floating or in the bodies of slaughtered whales. Pieces are usually small, but the largest have weighed almost 1,000 lb (450 kg).

amberjack Any of various popular marine game fishes (genus Seriola), members of the jack family (Carangidae). Amberjacks are found worldwide. The greater amberjack of the tropical Atlantic is one of the largest jack species, often attaining a length of 6 ft (1.8 m).

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Ambler, Eric (b. June 28, 1909, London, Eng. — d. Oct. 22, 1998, London) British author of espionage and crime novels. Among his works are The Dark Frontier (1936), Epitaph for a Spy (1938), A Coffin for Dimitrios (1939), Journey into Fear (1940; film, 1942), and The Light of Day (1962). In contrast to earlier British spy stories, in which xenophobic, romantic heroes defeated vast conspiracies to dominate the world, Ambler's tales were of ordinary, educated Englishmen thrust by chance or curiosity into danger. Notable for its gritty realism, Ambler's fiction was a major influence on writers such as Graham Greene and John Le Carre.

Ambon \am-'bon\ Island of the Moluccas, Indonesia. Located in the Malay Archipelago, it is 31 mi (50 km) long and 10 mi (16 km) wide, with an area of 294 sq mi (761 sq km). Its chief port is also called Ambon (pop., 2000: 205,664). The island is subject to earthquakes and volcanic activity; Mount Salhatu (3,405 ft [1,038 m]) is its highest point. The clove trade first attracted the Portuguese, who founded a settlement in 1521. The Dutch ousted the Portuguese in 1605, took over the spice trade, and in 1623 killed English settlers in the Amboina Massacre. The British captured Ambon in 1796 and 1810, but it was restored to the Dutch in 1814. The Japanese occupied it during World War II. Retaken by the Dutch in 1945, it became part of Indonesia in 1949. A short-lived independence movement there in 1950 was soon suppressed.

Ambrose, Saint (b. 339, Augusta Treverorum, Belgica, Gaul — d. 397, Milan; feast day December 7)

Bishop of Milan. Raised in Rome, he became a Roman provincial governor. As a compromise candidate, he was unexpectedly elevated from unbaptized layman to bishop of Milan in 374. He established the medieval concept of the Christian emperor as subject to episcopal advice and censure when he forced the emperor Theodosius to seek forgiveness from the bishop, and he opposed tolerance for adherents of Arianism. He wrote theological treatises influenced by Greek philosophy, including On the Holy Spirit and On the Duties of Ministers, as well as a series of hymns. His brilliant sermons and personal example converted St. Augustine.

AMC See American Motors Corp.

AME Church See African Methodist Episcopal Church

Amelung Vam-9-bq\ glass U.S. glass produced between 1784 and c.

1795 by John Frederick Amelung.

Born in Bremen, Ger., he founded the New Bremen Glass Manufactory near Frederick, Md., U.S., with financial support from German and U.S. promoters. He attempted to set up a crafts community, importing glassworkers and other craftsmen from Germany, but the industry failed when Congress defeated Amelung’ s petition for a loan in 1790. Few authentic pieces of Amelung glass survive, most of them presentation pieces decorated with restrained engraving.

amen Expression of agreement or confirmation used in worship by Jews, Christians, and Muslims. The word derives from a Semitic root meaning “fixed” or “sure.” The Greek Old Testament usually translates it as “so be it”; in the English Bible it is often translated as “verily” or “truly.” By the 4th century bc, it was a common response to a doxology or other prayer in the Jewish temple liturgy. By the 2nd century ad, Christians had adopted it in the liturgy of the Eucharist, and in Christian worship a final amen now often sums up and confirms a prayer or hymn. Though less common in Islam, it is used after reading of the first sura.

Amen See Amon

Amenemhet Va-mo-nom-'heA I (fl. 20th century bc) Egyptian pharaoh (r. 1938-08 bc) who founded the 12th dynasty (1938-1756) and, with provincial governors, restored unity to Egypt after the civil war that followed the death of his predecessor, Montuhotep IV. He moved the capital from Thebes to near modern-day Al-Lisht, south of Memphis. He

extended Egyptian control up the Nile and fortified the delta. Reaffirming the Egyptian monarchy's claim to divinity, he also enlarged the Temple of Amon at Thebes. In 1918 bc he made his son, Sesostris I, his coruler. He was assassinated 10 years later.

Amenhotep Va-mon-'ho-.tepV II (fl. 15th century bc) Egyptian pharaoh (r. 1514-1493 bc), son and successor of Ahmose I. Amenhotep extended Egyptian rule southward to the Third Cataract of the Nile while also maintaining rule in the northeast. He pioneered the transition away from pyramidal tombs to rock-cut tombs in the Valley of the Kings in western Thebes. The royal mortuary temples were erected at the edge of the desert during his reign, though the location of his own tomb is unknown.

Amenhotep III (fl. 14th century bc) Egyptian pharaoh (r. 1390-53 bc) during a time of prosperity. Early in his reign he led a military campaign south of Egypt, but otherwise his rule was peaceful. His reign is noted for the expansion of diplomacy with Syria, Cyprus, Babylon, and Assyria, and the construction of public buildings in Memphis, Thebes, and Nubia, including portions of the temples at Luxor and Karnak. He broke with tradition by marrying Tiy, a commoner, with whom he shared his rule. He was succeeded by his son Akhenaton.

Amenhotep IV See Akhenaton

amenorrhea \,a- 1 men-3- , re-9\

Lack of menstruation. Signs of primary amenorrhea (failure to start menstruating by age 16) include infantile reproductive organs, lack of breasts and pubic hair, dwarfism, and deficient muscle development. In secondary amenorrhea (abnormal cessation of cycles once started), the genitals atrophy and pubic hair diminishes. Not itself a disease, amenorrhea reflects a failure in the balance among the hypothalamus, pituitary gland, ovaries, and uterus; tumours, injuries, or diseases of these can lead to amenorrhea. Other causes include systemic diseases, emotional shock, stress, hormone over- or underproduction, anorexia

nervosa, absence of ovaries or uterus, pregnancy, lactation, and menopause. Infrequent menstruation or amenorrhea not resulting from organic disease is not harmful.

America See Central America, North America, South America
America Online See AOL Time Warner Inc.

American Airlines Major U.S. airline. American was created through a merger of several smaller U.S. airlines and incorporated in 1934. It continued to buy the routes of other airlines, becoming an international carrier in the 1970s; its routes include South America, the Caribbean, Europe, and the western Pacific. Its parent company, AMR Corp., also has holdings in food services, hotels, and airport ground services. The company acquired Trans World Airlines in 2001.

American aloe See century plant

American Anti-Slavery Society Main activist arm of the U.S. abolition movement, which sought an immediate end to slavery in the coun-

St. Ambrose, detail from a stained-glass window; in St. Michael's Church, Kirby-le-Soken, Essex, Eng.

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Amenhotep II offering sacrifices, statue, 1 5th century bc; in the Egyptian Museum, Cairo

BY COURTESY OF THE EGYPTIAN MUSEUM; PHOTOGRAPH, HIRMER FOTOARCHIV, MUNCHEN

Amenhotep III, head of a statue from western Thebes, c. 1 390 bc

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try (see abolitionism). Cofounded in 1833 by William Lloyd Garrison and Arthur Tappan, it promoted the formation of state and local auxiliaries to agitate for abolition. Despite violent opposition, by 1840 the group had

2,000 auxiliaries and more than 150,000 members, including Theodore Weld and Wendell Phillips. Its most effective public meetings featured testimony by former slaves, including Frederick Douglass and William Wells Brown. In 1839 it split into two factions: a radical group led by Garrison that denounced the Constitution as supportive of slavery and a moderate faction led by Tappan that led to the birth of the Liberty Party.

American Association of Retired Persons See AARP

American Ballet Theatre Prominent ballet company based in New York City. It was founded in 1939 as the Ballet Theatre (the name was changed in 1958) by Lucia Chase and Richard Pleasant to promote works "American in character." Oliver Smith replaced Pleasant as codirector in 1945; Mikhail Baryshnikov served as artistic director from 1980 to 1989 after dancing with the company in the 1970s. New ballets were created for the company by Agnes de Mille, Jerome Robbins, Twyla Tharp, and Antony Tudor; Michel Fokine revived many of his earlier works for them as well. Principal dancers have included Alicia Alonso, Erik Bruhn, Anton Doun, and Natalia Makarova.

American Bar Association (ABA) Voluntary association (founded 1878) of U.S. lawyers, judges, and other legal professionals. The largest bar association in the U.S., it seeks to improve the legal profession, ensure the availability of legal services to all citizens, and improve the administration of justice. It conducts educational and research projects, sponsors professional meetings, and publishes a monthly journal. At the beginning of the 21st century its membership exceeded 400,000.

American Broadcasting Co. See ABC

American Civil Liberties Union (ACLU) Organization founded by Roger Baldwin and others in New York City in 1920 to champion constitutional liberties in the U.S. It works for three basic concepts: freedom of expression, conscience, and association; due process of law; and equal protection under the law. From its founding it has initiated test cases and intervened in cases already in the courts. It may provide legal counsel, or it may file an amicus curiae brief. The Scopes trial was one of its test cases; it provided counsel for the Sacco-Vanzetti case. In the 1950s and '60s it opposed the blacklisting of supposed left-wing subversives and worked to guarantee freedom of worship and the rights of the accused. Its work is performed by volunteers and full-time staff, including lawyers who provide free legal counsel. See also civil liberty.

American Civil War or Civil War or War Between the States

(1861-65) Conflict between the U.S. federal government and 11 Southern states that fought to secede from the Union. It arose out of disputes over the issues of slavery, trade and tariffs, and the doctrine of states' rights. In the 1840s and '50s, Northern opposition to slavery in the Western territories caused the Southern states to fear that existing slaveholdings, which formed the economic base of the South, were also in danger. By the 1850s abolitionism was growing in the North, and when the antislavery Republican candidate Abraham Lincoln was elected president in 1860, the Southern states seceded to protect what they saw as their right to keep slaves. They were organized as the Confederate States of America under Jefferson Davis. The Northern states of the federal Union, under Lincoln, commanded more than twice the population of the Confederacy and held greater advantages in manufacturing and transportation capac-

ity. The war began in Charleston, S.C., when Confederate artillery fired on Fort Sumter on April 12, 1861. Both sides quickly raised armies. In July 1861, 30,000 Union troops marched toward the Confederate capital at Richmond, Va., but were stopped by Confederate forces in the Battle of Bull Run and forced to retreat to Washington, D.C. The defeat shocked the Union, which called for 500,000 more recruits. The war's first major campaign began in February 1862, when Union troops under Ulysses S. Grant captured Confederate forts in western Tennessee. Union victories at the battles of Shiloh and New Orleans followed. In the East, Robert E. Lee won several Confederate victories in the Seven Days' Battles and, after defeat at the Battle of Antietam, in the Battle of Fredericksburg (December 1862). After the Confederate victory at the Battle of Chancellorsville, Lee invaded the North and engaged Union forces under George Meade at the momentous Battle of Gettysburg. The war's turning point in the West occurred in July 1863 with Grant's success in the Vicksburg Campaign, which brought the entire Mississippi River under Union control. Grant's command was expanded after the Union defeat at the Battle of Chicka-

mauga, and in March 1864 Lincoln gave him supreme command of the Union armies. He began a strategy of attrition and, despite heavy Union casualties at the battles of the Wilderness and Spotsylvania, began to surround Lee's troops in Petersburg, Va. (see Petersburg Campaign). Meanwhile William T. Sherman captured Atlanta in September (see Atlanta Campaign), set out on a destructive march through Georgia, and soon captured Savannah. Grant captured Richmond on April 3, 1865, and accepted Lee's surrender on April 9 at Appomattox Court House. On April 26 Sherman received the surrender of Joseph Johnston, thereby ending the war. The mortality rates of the war were staggering — there were about 620,000 deaths out of a total of 2.4 million soldiers. The South was devastated. But the Union was preserved, and slavery was abolished.

American Express Co. U.S. credit card and travel services company. Founded in 1850 as an express-transportation company, American Express originally provided rapid transport of goods across New York and the Midwest. The company introduced traveler's checks in 1891 and opened its first European office in Paris in 1895. Its contemporary businesses include credit cards and payment-processing systems, international banking, and services for travelers (including trip planning, tour packages, and business travel management).

American Federation of Labor-Congress of Industrial Organizations See AFL-CIO

American Fur Co. Enterprise formed by John Jacob Astor in 1808 that dominated the U.S. fur trade early in the 19th century. The company, considered the first U.S. business monopoly, absorbed or drove out rivals throughout the central and western U.S. Exploration by its trappers and traders helped open the frontier to settlement. By 1 834, when Astor sold his company, it had become the largest commercial organization in the U.S.

American Indian or Native American or Amerindian Any

member of the various aboriginal peoples of the Western Hemisphere, with the exception of the Eskimos (Inuit) and the Aleuts. Though the term Native American is today often preferred over American Indian, particularly in the U.S. , many Native American peoples continue to prefer American Indian (or Indian). In Canada the name First Nation is preferred. The

ancestors of the American Indians were nomadic hunters of northeast Asia who migrated over the Bering Strait land bridge into North America probably during the last glacial period (20,000-30,000 years ago). By c. 10,000 bc they had occupied much of North, Central, and South America. See also Anasazi culture; Andean civilization; Clovis complex; Eastern Woodlands Indian; Folsom complex; Hohokam culture; Hopewell culture; Mesoamerican civilization; Mississippian culture; Mogollon culture; Northwest Coast Indian; Plains Indian; Pueblo Indian; Southeastern Indian; Southwest Indian; Woodland culture.

American Indian languages Languages spoken by the original inhabitants of the Americas and the West Indies and by their modem descendants. They display an extraordinary structural range, and no attempt to unite them into a small number of genetic groupings has won general acceptance. Before the arrival of Columbus, more than 300 distinct languages were spoken in North America north of Mexico by an estimated population of two to seven million. Today fewer than 170 languages are spoken, of which the great majority are spoken fluently only by older adults. A few widespread language families (Algonquian, Iroquoian, Siouan, M uskogean, Athabaskan, Uto-Aztecan, Salishan) account for many of the languages of eastern and interior North America, though the far west was an area of extreme diversity (see Hokan; Penutian). It is estimated that in Mexico and northern Central America (Mesoamerica), an estimated 15-20 million people spoke more than 300 languages before Columbus. The large Otomanguean and Maya families and a single language, Nahuatl, shared Mesoamerica with many smaller families and language isolates. More than 10 of these languages and language complexes still have more than 100,000 speakers. South America and the West Indies had an estimated pre-Columbian population of 10-20 million, speaking more than 500 languages. Important language families include Chibchan in Colombia and southern Central America, Quechuan and Aymaran in the Andean region, and Arawakan, Cariban, and Tupian in northern and central lowland South America. Aside from Quechuan and Aymaran, with about 10 million speakers, and the Tupian language Guarani, most remaining South American Indian languages have very few speakers, and some face certain extinction.

American Indian Movement (AIM) Civil rights organization founded in 1968, originally to help urban American Indians displaced by

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government programs. It later broadened its efforts to include demands for economic independence, autonomy over tribal areas, restoration of illegally seized lands, and protection of Indian legal rights and traditional culture. Some of its protest activities involved violence and were highly publicized (see Wounded Knee). Internal strife and the imprisonment of some leaders led to the disbanding of its national leadership in 1978, though local groups have continued to function.

American Indian religions. North Religious beliefs and practices

of the indigenous peoples of North America. They are characterized by a conviction that spirit moves through all things, animate and inanimate, and that the living are intimately connected with the souls of the dead. They discover recognizable beings in the natural world of animals, plants, and trees, as well as in natural features such as mountains, lakes, and clouds. Because North American religions were so highly localized, it is impossible to determine how many have existed, and their beliefs have varied widely. Whereas Iroquois elders speak of a perfectly wise and good Creator who planned the universe, the Koyukon envision the creator as Raven, a trickster god who is only one of many powerful spirits. Whereas nearly all Navajo ceremonies are performed on behalf of individuals in response to specific needs, most Pueblo ceremonies are performed communally and scheduled according to the cycles of nature. However, all native North American religions share certain features: ancestral lands and locally sacred spots are important; access to some knowledge is restricted, and initiation is required to acquire it; kinship obligations are central; the oral tradition includes narratives that record human interaction with non-human powers; and generosity is a religious act. Contact with Europeans led to development of new religious movements, including the Ghost Dance tradition and the Native American Church. See also Mesoamerican religions.

American Indian religions. South Religious beliefs and practices of the indigenous peoples of South America. The ancient Andean civilizations of the Chimu and the Inca had highly developed religions. The Inca religion combined complex ceremonies, animistic beliefs, belief in objects having magical powers, nature worship, and sun worship. The Incas built monumental temples, occupied by priests and Chosen Women. Priests conducted divination, and sacrifices were offered on every important occasion. Human sacrifice was offered when the need was extreme. In present-day South America, as many as 1,500 distinct native cultures have been described, and religious beliefs vary greatly. Creation mythologies are of major importance, often describing the origin of the first world and its fate as well as the creation and destruction of subsequent worlds. Ceremonial initiation into adulthood is widely practiced, both for males and females, with the initiation ceremony often acting out events from the dawn of creation. Initiations are also used to mark the ascent of individuals into positions of religious authority, with priests, diviners, and spirit mediums playing special roles. The shaman specializes in inducing states of ecstasy, controlling the passage of the soul out of and back into the body. Ritual fires, musical instruments (especially the rattle), esoteric languages, and sacred songs may be used in a theatrical performance designed to demonstrate the shaman’s command of invisible powers. Christianity has come to be a strong component of folk belief among many native peoples, but it continues to be interpreted in the light of local tradition, and elements of traditional religion continue to survive. See also Mesoamerican religions.

American Labor Party Minor political party organized in New York state in 1936. It was founded by the labour leaders Sidney Hillman and David Dubinsky and by liberal Democrats and old-line socialists. The party supported Franklin D. Roosevelt’s New Deal programs and backed candidates who endorsed liberal social legislation. Though influential in New York City elections, after 1940 it was plagued by divisions between pro- and anti-communist factions. It was dissolved in 1956.

American League (AL) One of the two associations of professional baseball teams in the U.S. and Canada designated as major leagues; the

other is the National League (NL). The AL was founded in 1900, and, beginning in 1903, the champions of the AL and NL have engaged in an annual World Series competition. There are now three divisions in the AL: Eastern (comprising the Baltimore Orioles, Boston Red Sox, New York Yankees, Tampa Bay Devil Rays, and Toronto Blue Jays), Central (Chicago White Sox, Cleveland Indians, Detroit Tigers, Kansas City Royals, and Minnesota Twins), and Western (Los Angeles Angels of Anaheim, Oakland Athletics, Seattle Mariners, and Texas Rangers).

American Legion Organization of U.S. war veterans. Founded in 1919, it works for the care of disabled and sick veterans and promotes compensation and pensions for the disabled, widows, and orphans. Nonpolitical and nonsectarian, its membership requirement is honourable service and an honourable discharge. It was instrumental in establishing veterans' hospitals, and it sponsored the creation of the U.S. Veterans Administration in 1930. In 1944 it played an important role in the passage of the Gl Bill. The American Legion claims about three million members in some 15,000 local posts, or groups.

American Medical Association (AMA) Organization of U.S. physicians. It was founded in 1847 "to promote the science and art of medicine and the betterment of public health." It has about 250,000 members, about half of all practicing U.S. physicians. It disseminates information to its members and the public, operates as a lobbying group, and helps set medical education standards. Its publications include Journal of the American Medical Association, American Medical News, and journals on medical specialties.

American Motors Corp. (AMC) Former U.S. automobile manufacturer. AMC was formed in 1954 from the merger of two pioneering auto manufacturers, Nash-Kelvinator Corp. (successor to Nash Motor Co., founded 1916) and Hudson Motor Car Co. (founded 1909). AMC produced AMC compact cars, AM General trucks and buses, and, until 1968, Kelvinator appliances. Jeeps joined the product line after AMC purchased the Kaiser-Jeep Corp. (dating to 1903) in 1970. AMC became a subsidiary of Chrysler Corp. in 1987, which in turn merged with Daimler-Benz in 1998 to form DaimlerChrysler AG.

American Museum of Natural History Major centre of research and education on the natural sciences, established in New York City in 1 869. It pioneered in staging field expeditions and creating dioramas and other lifelike exhibits showing natural habitats and their plant and animal life. Its research collections contain tens of millions of specimens, and its fossil and insect collections are among the largest in the world. It conducts research in anthropology, astronomy, entomology, herpetology, ichthyology, invertebrate biology, mammalogy, mineralogy, ornithology, and vertebrate paleontology, and it maintains permanent research stations in The Bahamas and the U.S. states of New York, Florida, and Arizona. It also contains one of the world's largest planetariums.

American Party See Know-Nothing Party

American Protective Association (APA) Secret anti-Catholic, anti-immigrant society formed in Iowa in 1887. Its membership, consisting mainly of farmers who feared the growth and political power of immigrant-populated cities, rose to more than two million in the 1890s. Membership dwindled after the election of 1896 and the return of agri-

cultural prosperity in the Midwest. By 1911 the society had disappeared.

American Renaissance or New England Renaissance Period from the 1830s roughly until the end of the American Civil War in which U.S. literature came of age as an expression of a national spirit. The literary scene was dominated by New England Brahmin writers, notably Henry Wadsworth Longfellow, Oliver Wendell Holmes, and James Russell Lowell. Also influential were the Transcendentalists (see Transcendentalism), including Ralph Waldo Emerson and Henry David Thoreau, as well as the great imaginative writers Nathaniel Hawthorne, Herman Melville, Walt Whitman, and Edgar Allan Poe.

American Revolution or United States War of Independence (1775 -83) War that won political independence for 13 of Britain's North American colonies, which formed the United States of America. After the end of the costly French and Indian War (1763), Britain imposed new taxes (see Stamp Act; Sugar Act) and trade restrictions on the colonies, fueling growing resentment and strengthening the colonists' objection to their lack of representation in the British Parliament. Determined to achieve independence, the colonies formed the Continental Army, composed chiefly of minutemen, to challenge Britain's large, organized militia. The war began when Britain sent a force to destroy rebel military stores at Concord, Mass. After fighting broke out on April 19, 1775 (see Battles of Lexington and Concord), rebel forces began a siege of Boston that ended when American forces under Henry Knox forced out the British troops under William Howe on March 17, 1776 (see Battle of Bunker Hill). Britain's offer of pardon in exchange for surrender was refused by the Americans, who declared themselves independent on July 4, 1776 (see Declaration of Independence). British forces retaliated by driv-

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ing the army of George Washington from New York to New Jersey. On December 25, Washington crossed the Delaware River and won the battles of Trenton and Princeton. The British army split to cover more territory, a fatal error. In engaging the Americans in Pennsylvania, notably in the Battle of the Brandywine, they left the troops in the north vulnerable. Despite a victory in the Battle of Ticonderoga, British troops under John Burgoyne were defeated by Horatio Gates and Benedict Arnold in the Battle of Saratoga (Oct. 17, 1777). Washington quartered his 11,000 troops through a bleak winter at Valley Forge, where they received training from Frederick Steuben that gave them victory in Monmouth, N.J., on June 28, 1778. British forces in the north thenceforth chiefly concentrated near New York. France, which had been secretly furnishing aid to the Americans since 1776, finally declared war on Britain in June 1778. French troops assisted American troops in the south, culminating in the successful Siege of Yorktown, where Charles Cornwallis surrendered his forces on Oct. 19, 1781, bringing an end to the war on land. War continued at sea, fought chiefly between Britain and the U.S.'s European allies. The navies of Spain and the Netherlands contained most of Britain's navy near

Europe and away from the fighting in America. The last battle of the war was won by the American navy under John Barry in March 1783 in the Straits of Florida. With the Treaty of Paris (Sept. 3, 1783), Britain recognized the independence of the U.S. east of the Mississippi River and ceded Florida to Spain.

American Saddlebred or American Saddle Horse Breed of light horse that originated in the U.S. The breed was developed by crossing Thoroughbreds, Morgans, and Standardbreds on native mares having an easy gait. It stands 15-16 hands (5-5.3 ft [1.5-1. 6 m]) high, and its colours are bay, brown, black, gray, and chestnut. Two show categories are for three-gaited and five-gaited horses. The three natural gaits are walk, trot, and canter; the five-gaited horse also has two trained gaits, the rack and the slow gait, or running walk. The American Saddlebred is also well known as a fine harness horse for show.

American Samoa officially Territory of American Samoa

Unincorporated U.S. territory (pop., 2000: 57,291), southwest-central Pacific Ocean. It includes the islands of Tutuila (the largest, with over two-thirds of the territory’s land area and almost all of the population), Aunuu, Rose, Swains, and the Manua group. Area: 77 sq mi (199 sq km). Capital: Fagatogo (Pago Pago; on Tutuila). Languages: Samoan, English (both official). Religion: Christianity (mostly Protestant; also Roman Catholic, other Christians). Currency: U.S. dollar. Most of the islands are rocky, formed from extinct volcanoes, and are surrounded by coral reefs. Tutuila and the islands of Manua are dominated by central mountain ranges. Fishing and tourism are major industries, but the U.S. administration is the main employer. The majority of the population is of Samoan ancestry. The islands were probably inhabited by Polynesians 3,000 years ago. Dutch explorers became the first Europeans to visit the islands in 1722. Missionaries began arriving in the islands in the 1830s. The U.S. gained the right to establish a naval station at Pago Pago in 1878, and the U.S., Britain, and Germany administered a tripartite protectorate in 1 889—99. The high chiefs ceded the eastern islands to the U.S. in 1904. American Samoa was administered by the U.S. Department of the Navy until 1951 and afterward by the Department of the Interior. Its current constitution was approved in 1967, and in 1978 the territory’s first elected governor took office.

American Stock Exchange (AMEX) Stock exchange in the U.S. Originally known as “the Curb,” it began as an outdoor marketplace in New York City c. 1850. It moved indoors to its present location in the Wall Street area in 1921. Once a marketplace for securities not reputable enough for the New York Stock Exchange, it became equally respectable, with its own listing admissions requirements. In 1998 it merged with the National Association of Securities Dealers (NASD), then-owner of the NASDAQ exchange, to form the Nasdaq-Amex Market Group. After NASD sold its interest in the NASDAQ in 2000, AMEX remained a NASD subsidiary.

American System of manufacture Production of many identical parts and their assembly into finished products. Though Eli Whitney has been credited with this development, the ideas had appeared earlier in Europe and were being practiced in arms factories in the U.S. (see armoury practice). Marc Brunel, while working for the British Admiralty (1802-08), devised a process for producing wooden pulley blocks by sequential machine operations, whereby 10 men (rather than the 110 needed previ-

ously) could make 160,000 pulley blocks per year. Not until London’s Crystal Palace exhibition (1851) did British engineers, viewing exhibits of machines used in the U.S. to produce interchangeable parts, begin to apply the system. Within 25 years, the American System was being widely used in making a host of industrial products. See also assembly line; factory.

American Telephone and Telegraph Co. See AT&T

America's Cup Most prestigious trophy in international yachting competition. First offered under another name in Britain in 1851, the cup was won easily by the America from New York and subsequently became known as the America’s Cup. The America’s Cup race, held about every four years, is between one defending vessel and one challenging vessel; each must be designed and built in the country it represents. The 22.6-mi (36.4-km) racecourse is divided into eight legs. The U.S. completely dominated the competition until 1983, when it was defeated by Australia. New Zealand won the Cup in 1995 and retained it in 2000 by defeating a challenger from Italy in the first competition without a U.S. participant.

americium V.am-o-'ri-she-omN Synthetic radioactive chemical element, chemical symbol Am, atomic number 95. The fourth transuranium element discovered, it was first produced in 1944 from plutonium-239 in a nuclear reactor. The isotope americium-241 has been prepared in kilogram quantities and is used in a variety of measuring applications that utilize its gamma radiation. Its most familiar use is in household smoke detectors.

Amerindian See American Indian

Ames, Fisher (b. April 9, 1758, Dedham, Mass. — d. July 4, 1808, Dedham, Mass., U.S.) U.S. essayist and Federalist politician. He graduated from Harvard College in 1774 and taught school for five years before turning to the law; he was admitted to the bar in 1781. Supporting the creation of a strong central government, Ames argued for ratification of the new U.S. Constitution at the Massachusetts constitutional convention. He became known for his uncompromising advocacy of the rights of property and his protective attitude toward commercial interests, which he defended in trenchant writing and commanding speech. In 1788 he defeated Samuel Adams for a seat in the first session of the U.S. House of Representatives; he was reelected three times. His eloquent support of the treaty negotiated by John Jay to preserve peace with England (1794) convinced the House to pass an enabling appropriation.

Ames, Winthrop (b. Nov. 25, 1870, North Easton, Mass., U.S. — d. Nov. 3, 1937, Boston, Mass.) U.S. theatrical producer and manager. Born into a wealthy New England family, he traveled to Europe in 1904 to study the management of 60 opera and theatre companies. After comanaging a Boston theatre, he became managing director of New York City’s New Theatre (1908-11). He founded the Little Theatre and the Booth Theatre, where he produced and directed such successful plays as The Philanderer (1913), Beggar on Horseback (1924), and a series of Gilbert and Sullivan revivals (1926-29). His Snow White (1913) was the first play produced in the U.S. especially for children.

amesha spenta \a-'mesh-3-'spen-t9\ In Zoroastrianism, any of the six divine beings (three male, three female) created by Ahura Mazda to help

govern creation. They are worshiped separately, and each has a special month, festival, and flower. The most important are Asha Vahishta (“Truth”), who presides over the sacred fire and holds out the path of justice and spiritual knowledge, and Vohu Manah (“Good Mind”), who welcomes the blessed into paradise. Khshathra Vairya (“Desirable Dominion”) presides over metal, Spenta Armaiti (“Beneficent Devotion”) over earth, and Haurvatat (“Wholeness”) and Ameretat (“Immortality”) over water and plants. In later Zoroastrianism, each is opposed by a specific archfiend.

amethyst Transparent, coarse-grained variety of quartz that is valued as a semiprecious gem for its violet colour. It contains a little more iron oxide (Fe 2 0 3) than any other variety of quartz, and its colour probably arises from this iron content. Heating removes the colour or changes it to the yellow of citrine; most commercial citrine is made in this manner. Notable deposits are found in Brazil, Uruguay, Ontario, and North Carolina. The birthstone for February, amethyst is usually faceted with step cuts or emerald cuts but also has been used since ancient times for carved intaglios. See photograph on opposite page.

AMEX See American Stock Exchange

Amhara Vam-'ha-rsX People of the Ethiopian central highlands. The Amhara number some 18 million and compose almost three-tenths of

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Ethiopia’s population. Their language is Amharic, a Semitic language of the Afro-Asiatic family, and their religion is Ethiopian Orthodox. The Amhara, who have dominated the history of their country, descend from ancient Semitic conquerors who mingled with indigenous Cushitic peoples. They are agriculturalists and place great value on land ownership.

Amharic \am-'ha-rik\ language Semitic tANGUAGE of Ethiopia. Amharic is spoken by more than 1 8 million people as a first language and is used as a lingua franca throughout much of central highland Ethiopia. Its status as a de facto national language is largely due to the long dominance of the Ethiopian monarchy by Amhara sovereigns. Amharic is written in a modified form of the partly syllabic, partly alphabetic script used to write Ge'ez, the classical language of Christian Ethiopian civilization (see Ethiopic languages). Though manuscripts in Amharic are known from the 14th century, the language has only recently been used as a general medium for literature, journalism, and education.

Amherst, Jeffery Amherst, 1st Baron (b. Jan. 29, 1717, Sevenoaks, Kent, Eng. — d. Aug. 3, 1797, Sevenoaks) British army commander. In the French and Indian War, he took the French fort at Louisbourg, Cape Breton Island, in 1758 and was promoted to chief of command in America. In 1760 he directed the campaign that captured Quebec and Montreal, and in 1761 he quelled the Indian uprising under

Pontiac. Having secured Canada for Britain, he remained there as governor-general until 1763. Returning to England, he served as commander in chief of the British army (1772-95), but his tenure was marred by failure in the war with the American colonies and by serious abuses in the army. He was created a baron in 1776 and a field marshal in 1796. Several U.S. towns and Amherst College are named for him.

Amherst \'am-orst\ College Private liberal arts college in Amherst, Massachusetts, U.S., chartered in 1825. Noah Webster was one of its founders. Consistently ranked as one of the finest colleges in the U.S., it offers a wide range of courses in the humanities, social sciences, and natural sciences. Originally a men’s college, it became coeducational in 1975. It participates in an exchange program with nearby Hampshire, Mount Holyoke, and Smith colleges and the University of Massachusetts.

amicus curiae Vo-'me-kos-'kyiir-e-I, o-'ml-kos-'kyur-e-eV (Latin: “friend of the court”) One who assists a court by furnishing information or advice regarding questions of law or fact. A person (or other entity, such as a state government) who is not a party to a particular lawsuit but nevertheless has a strong interest in it may be allowed, by leave of the court, to file an amicus curiae brief, a statement of particular views on the subject matter of the lawsuit. Such briefs are often filed in cases involving public-interest matters (e.g., entitlement programs, consumer protection, civil rights).

Amida See Amitabha

amide \'a-,mld\ Any member of either of two classes of nitrogen-containing organic compounds related to ammonia and amines and containing a carbonyl group (— C=0; see functional group). The first class, covalent amides are formed by replacing the hydroxyl group (— OH) of an acid with an amino group (— NR 2 , in which R may represent a hydrogen atom or an organic combining group, such as methyl). Amides formed from carboxylic acids, called carboxamides, are solids except for the simplest, formamide, a liquid. They do not conduct electricity, have high boiling points, and (when liquid) are good solvents. There are no practical natural sources of simple covalent amides, but the peptides and proteins in living systems are long chains (polymers) with peptide bonds (see covalent bond), which are amide linkages. Urea is an amide with two amino groups. Commercially important covalent amides include several used as solvents; others are the sulfa drugs and nylon. The second class, ionic (salt-like) amides (see ionic bond), are made by treating a covalent amide, an amine, or ammonia with a reactive metal (e.g., sodium) and are strongly alkaline.

Amiens \am-'ye n \ ancient Samarobriva later Ambianum City (pop., 1999: 135,801), northern France. Located on the Somme River, it became a Roman stronghold. The chief city of a medieval county, it passed

to Burgundy in 1435 and was captured by the Spanish in 1597. Recovered by Henry IV, it served as the capital of Picardy until 1790. The Prussians captured the city in 1870, and the Germans held it briefly in 1914; it gave its name to a successful Allied counteroffensive against Germany in 1918. The Germans occupied it during World War II. It has been a major centre of the French textile industry since the 16th century and is the site of the Gothic cathedral of Notre-Dame, the largest church in France.

Amiens \am-'ya n \. Treaty of (March 27, 1802) Agreement signed at Amiens, France, by Britain, France, Spain, and the Batavian Republic (The Netherlands). By the treaty, France and its allies recovered most of their colonies, despite their military reverses overseas. The treaty ignored continuing trade differences between Britain and France, but it achieved a peace in Europe for 14 months during the Napoleonic Wars.

Amin \a-'men\ (Dada Oumee), Idi (b. 1924/25, Koboko, Ugan. — d. Aug. 16, 2003, Jiddah, Saud.Ar.)

Military officer and president (197 1—79) of Uganda. A member of the small Kakwa ethnic group and a Muslim, he was closely associated during his military career with Milton Obote, Uganda’s first prime minister and president. In 1971 he staged a coup against Obote. He expelled all Asians from Uganda in 1972, reversed Uganda’s amicable relations with Israel, was personally involved in the Palestinian hijacking of a French airliner to Entebbe (see Entebbe raid), and ordered the torture and murder of 100,000-300,000 Ugandans. In 1978 he ordered an attack on Tanzania, but Tanzanian troops, aided by Ugandan nationalists, were able to overpower the invaders. As the Tanzanian-led forces neared Kampala, Uganda’s capital, Amin fled to Libya and eventually settled in Saudi Arabia.

amine \o-'men\ Any of a class of NiTROGEN-containing organic compounds derived, either in principle or in practice, from ammonia (NH_3). Almost all their chemical names end in -ine. Replacement of one, two, or all three of the hydrogen atoms in ammonia with organic groups yields primary, secondary, or tertiary amines, respectively. Addition of a fourth hydrogen with an accompanying positive charge on the nitrogen atom results in a quaternary amine. Naturally occurring amines include alkaloids, present in certain plants; some neurotransmitters, including dopamine and epinephrine; and histamine. Industrially important amines include aniline, ethanolamine, and others, used in making rubber, dyes, pharmaceuticals, and synthetic resins and fibres and in a host of other applications. A nitrogen atom with one or two hydrogens is often referred to as an amino group.

amino acid \3-'me-no\ Any of a class of organic compounds in which a carbon atom has bonds to an amino group (— NH_2), a carboxyl group (— COOH), a hydrogen atom (— H), and an organic side group (called — R). They are therefore both carboxylic acids and amines. The physical

and chemical properties unique to each result from the properties of the R group, particularly its tendency to interact with water and its charge (if any). Amino acids joined linearly by peptide bonds (see covalent bond) in a particular order make up peptides and proteins. Of over 100 natural amino acids, each with a different R group, only 20 make up the proteins of all living organisms. Humans can synthesize 10 of them (by interconversions) from each other or from other molecules of intermediary metabolism, but the other 10 (essential amino acids: arginine, histidine, isoleucine,

LEUCINE, LYSINE, METHIONINE, PHENYLALANINE, THREONINE, TRYPTOPHAN, and VALINE) must be consumed in the diet.

Amis \'a-mis\, Martin (b. Aug. 25, 1949, Oxford, Oxfordshire, Eng.) British writer and critic. The son of writer Kingsley Amis, he graduated from Oxford University in 1971. He worked for the Times Literary Supplement and the New Statesman before becoming a full-time writer. His works — including the novels Money (1984), London Fields (1989), and Night Train (1998) as well as the short-story collection Heavy Water

White-tipped amethyst from Guerrero, Mexico

LEE BOLTIN

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(1999) — feature inventive word play and often scabrous humour as they satirize the horrors of modem urban life. Amis also published an acclaimed autobiography. Experience (2000), and an idiosyncratic volume centred on Joseph Stalin, Koba the Dread (2002).

Amis, Sir Kingsley (William) (b. April 16, 1922, London, Eng. — d. Oct. 22, 1995, London) British novelist, poet, critic, and teacher. His first novel, Lucky Jim (1954; film, 1957), was a hugely successful comic masterpiece. He was often characterized as an Angry Young Man, a label he rejected. Notable among his more than 40 books (including four volumes of poetry) are the mordantly humorous novels That Uncertain Feeling (1955; film. Only Two Can Play , 1962), The Green Man (1959; film, 1957), Jake’s Thing (1978), and The Old Devils (1986, Booker Prize). He was the father of Martin Amis.

Amish Ya-mish\ Member of a conservative Christian group in North America known as the Old Order Amish Mennonite Church. The Amish originated in 1693-97 as followers of the Mennonite elder Jakob Ammann (16447-c. 1730) in Switzerland, Alsace, and Germany. He taught that lying was grounds for excommunication (which meant being shunned by all other Mennonites), that clothing should be uniform and beards untrimmed, and that the state church should be avoided. Migration to

North America and assimilation eliminated the Amish in Europe. They settled in Pennsylvania in the 18th century. After 1850 they split into “Old Order” (traditional) and “New Order” (now the Mennonite churches). Old Order Amish now live in Pennsylvania, Ohio, Indiana, Iowa, Illinois, and Kansas. Adults are baptized and admitted to formal church membership at age 17 to 20. Services are in Pennsylvania Dutch (a German dialect) and some English. Though similar in theology to Mennonites, Amish wear modest, old-fashioned clothing and generally reject modem technology, including automobiles and telephones.

Amistad mutiny (July 2, 1839) Slave rebellion aboard the schooner Amistad. The revolt took place off the coast of Cuba when 53 Africans who had been abducted from Sierra Leone for the slave trade, seized control of the ship, killed the captain and cook, and ordered the navigator to sail for Africa. Pretending to do so, he sailed generally northward instead, and the ship was intercepted two months later off New York. Despite attempts by Pres. Martin Van Buren to send the Africans to Cuba, abolitionists demanded a trial, contending the men were free under international law. A federal judge agreed, and the government appealed to the U.S. Supreme Court, where in 1841 defending counsel John Quincy Adams successfully argued that the men should be freed. Donations helped the 35 survivors to return to Sierra Leone in 1842.

Amitabha \,am-i-'ta-b3\ Japanese Amida Saviour deity worshiped by followers of Pure Land Buddhism in Japan. According to the Sukhavati-vyuha-sutra (Pure Land SUTRA), the monk Dharmakara vowed many ages ago that once he attained buddhahood, all who believed in him and called upon his name would be born into his paradise (the Pure Land) and reside there until achieving nirvana.

The cult of Amitabha came to the forefront in China c. 650 and then spread to Japan, where it led to the formation of the Pure Land and True Pure Land sects. In Tibet and Nepal,

Amitabha is regarded as one of the five eternal buddhas (rather than as a saviour), who manifested himself as the earthly Buddha Gautama and as the BODHISATTVA AVALOKITESVARA.

Amman \a-'man\ City (pop., 2000 est.: 1,147,447), capital of Jordan. It lies 25 mi (40 km) northeast of the Dead Sea. Amman is by far the largest city of Jordan. Fortified settlements have existed in the area from remote antiquity; the earliest date from the Chalcolithic Period (c. 4000-3000 bc). As Rabbah, it became the capital of the Ammonites. It was conquered by Egypt’s Ptolemy II (Ptolemy Philadelphus), who renamed it Philadelphia, a name it retained through Roman times. Taken by the Arabs in ad 635, it later went into decline and subsequently disappeared. In 1878 the Ottoman Empire resettled it. When the British established the country of Transjordan in 1921, Amman

became its capital. Its modem development was furthered by the independence of Transjordan in 1946. Along with the rest of Jordan (the country's name from 1949), Amman has had to absorb a large number of Arab refugees that fled Palestine during the Arab- Israeli wars.

Ammannati \,am-an-'na-te\ / Bartolommeo or Bartolommeo Ammanati (b. June 18, 1511, Settignano, near Florence — d. April 22, 1592, Florence) Italian sculptor and architect active chiefly in Florence. He trained under Baccio Bandinelli in Florence and Jacopo Sansovino in Venice. In 1550 he went to Rome, where he collaborated with Giorgio Vasari and Giacomo da Vignola on the Villa Giulia. In 1555 he returned to Florence, where he spent the rest of his career working for the Medicis. He finished the Laurentian Library, begun by Michelangelo, but is best known for the Bridge of Santa Trinita and his additions to Filippo Brunelleschi's Pitti Palace, including the courtyard. His buildings mark the transition from the Classicizing Renaissance to the more exuberant Baroque style.

ammonia \9-'mo-ny3\ Colourless, pungent gas composed of nitrogen and hydrogen, chemical formula NH 3 . Easily liquefied by compression or cooling for use in refrigerating and air-conditioning equipment, it is manufactured in huge quantities. Ammonia is made by the Haber- Bosch process (see Fritz Haber). Its major use is as a fertilizer, applied directly to soil from tanks of the liquefied gas. Also employed as fertilizers are salts of ammonia, including ammonium phosphate and ammonium nitrate (the latter used in high explosives as well). Ammonia has many other industrial uses as a raw material, catalyst, and alkali. It dissolves readily in water to form ammonium hydroxide, an alkaline solution (see base) familiar as a household cleaner.

ammonia-soda process See Solvay process

ammonoid \'am-3-,n6id\ Any of a group of extinct shelled cephalopods, related to the modern pearly nautilus, that are commonly found as fossils in marine rocks of the Devonian through Cretaceous periods (410-65 million years ago). Most ammonoids were predators. The shells, either straight or coiled, served as protective and supportive structures and enabled the animals to compensate for varying water depths. Ammonoids are important index FOSSILS because of their wide geographic distribution in shallow marine waters, rapid evolution, and easily recognizable features. See also belemnoid.

amnesia Nam-'ne-zhsV Loss of memory as a result of brain injury or deterioration, shock, fatigue, senility, drug use, alcoholism, anesthesia, illness, or neurotic reaction. Amnesia may be anterograde (in which events following the causative trauma or disease are forgotten) or retrograde (in which events preceding the trauma or disease are forgotten). It can often be traced to a severe emotional shock, in which case personal memories (in effect, identity) rather than such abilities as language skills are affected. Such amnesia seems to represent an escape from disturbing memories and is thus an example of repression; these memories can generally be recovered through psychotherapy or after the amnesic state has ended. Amnesia may occasionally last for weeks, months, or even years, a condition known as fugue.

amnesty In criminal law, a sovereign act of oblivion or forgetfulness (from Greek amnestia, "forgetfulness") granted by a government, especially to a group of persons who are guilty of (usually political) crimes

in the past. It is often conditional upon the group’s return to obedience and duty within a prescribed period. See also pardon.

Amnesty International (Al) International human-rights organization. It was founded in 1961 by Peter Benenson, a London lawyer who organized a letter-writing campaign calling for amnesty for “prisoners of conscience.” AI seeks to inform the public about violations of human rights, especially abridgments of freedom of speech and religion and the imprisonment and torture of political dissidents. It actively seeks the release of political prisoners and support of their families when necessary. Its members and supporters are said to number one million people in some 140 countries. Its first director, Sean MacBride, won the 1974 Nobel Prize for Peace; AI itself won the award in 1977.

amniocentesis V.am-ne-o-sen-'te-sasN Surgical insertion of a hollow needle through the abdominal wall into the uterus of a pregnant female to extract fluid from the amniotic sac for analysis of fluid and fetal cells. This can reveal the fetus’s sex (important when sex-linked genetic disease is possible), chromosomal disorders, and other problems. First per-

Great bronze Amida (Daibutsu) at Kamakura, Japan, 1 252.

GAVIN HELUER— ROBERT HARDING PICTURE UBRARY/GETTY IMAGES

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formed in the 1930s, amniocentesis is generally done under local anesthesia in the 15th— 17th week of gestation.

amoeba \3-'me-b9\ One-celled protozoan that can form temporary extensions of cytoplasm (pseudopodia) in order to move about. Some amoebas are found on the bottom of freshwater streams and ponds. Others live in the human digestive system; one type causes amebic dysentery in humans. Each amoeba contains a small mass of jellylike cytoplasm with vacuoles and a nucleus. Food is taken in and material is excreted at any point on the cell surface. Amoebas are used extensively in cell research for determining the relative functions and interactions of the nucleus and the cytoplasm.

Amon \'a-,man\ or Amen Egyptian deity revered as king of the gods. Amon may have originated as a local deity at Khmun in Middle Egypt. His cult spread to Thebes, where he became patron of the pharaohs by Mentuhotep I’s reign (2008-1957 bc) and was identified with the sun god Re. Represented as a human, a ram, or both, Amon-Re was worshiped with the goddess Mut and the youthful god Khons. Akhenaton directed his reforms against the cult of Amon, but with little success, and Amon’s status was restored in the 14th— 1 3th century bc. In the New Kingdom, Amon came to be seen as one of a triad with Ptah and Re, and in the 1 1th- 10th century bc as a universal god who intervened in affairs of state by speaking through oracles.

amortization V.am-or-ti-'za-shonV In finance, the systematic repayment of a debt; in accounting, the systematic writing off of some account over a period of years. An example of the first meaning is a home mortgage, which may be repaid in monthly installments that include interest and a gradual reduction of the principal. Such systematic reduction is safer for the lender, since it is easier for the borrower to repay a series of small amounts than a single lump sum. In the second sense, a firm may gradually reduce the balance-sheet valuation of a depreciable asset such as a building, machine, or mine. The U.S. government has sometimes permitted accelerated amortization of assets, which encourages industrial development by decreasing a company’s tax burden in the years immediately after a purchase.

Amos (fl. 8th century bc) Earliest Hebrew prophet (one of the 12 Minor Prophets) to have a biblical book named for him. Born in Tekoa in Judah, he was a shepherd. According to the book of Amos, he traveled to the richer and more powerful northern kingdom of Israel to preach his visions of divine destruction and the message that God’s absolute sovereignty required justice for rich and poor alike and that God’s chosen people were not exempt from the moral order. He foretold the destruction of the northern kingdom and Judah and anticipated the predictions of doom by later biblical prophets.

Amos ' n ' Andy See Freeman and Charles Correll Gosden

a mo site Va-ms-.sfiA Variety of the silicate mineral cummingtonite, which is a source of asbestos. Cummingtonite is an amphibole mineral, an iron and magnesium silicate that occurs in metamorphic rocks in the form of long needlelike, fibrous crystals.

Ampere Va^'perX, Andre Marie (b. Jan. 22, 1775, Lyon, France — d. June 10, 1836, Marseille) French physicist, founder of the science of electromagnetism. A prodigy who mastered the entire known field of mathematics by age 12, he became a professor of physics, chemistry, and mathematics. He formulated a law of electromagnetism, called Ampere's law, that describes the magnetic force between two electric currents. An instrument he devised to measure the flow of electricity was later refined as the galvanometer. His chief published work was Memoir on the Mathematical Theory of Electrodynamic Phenomena (1827). The ampere (A) unit of electric current was named for him.

Ampere's law Law of electromagnetism that describes mathematically the magnetic force between two electric currents. It was named after A.-M. Ampere, who discovered that such forces exist. If two currents flow in the same direction, the force between the two wires is attractive; if they flow

in opposite directions, the force is repulsive. In each case, the force is directly proportional to the currents.

amphetamine Vam-'fe-to-.menX Organic compound, prototype of a class of synthetic amphetamine drugs (e.g., Benzedrine, Dexedrine, methamphetamine), that stimulates the central nervous system. It was first synthesized in 1887. Amphetamines cause wakefulness, euphoria, decreased fatigue, and increased ability to concentrate. Since they dull the appetite, they have been used for weight reduction. Often called “speed,” they are used (often illicitly) to stay awake. In children with attention deficit (hyperactivity) disorder, they have a calming effect, helping them concentrate. Undesirable effects include overstimulation, with paranoia, restlessness, insomnia, tremor, and irritability, and a deep depression when the drug wears off. This, along with rapid development of tolerance requiring increased doses, can lead to drug addiction.

amphibian Any member of a class (Amphibia) of cold-blooded vertebrate animals that includes more than 4,400 species in three groups: frogs and toads (order Anura), salamanders (order Caudata), and caecilians (order Apoda). Probably evolved from certain fish species of the Early Devonian period (417-391 million years ago), amphibians were the first vertebrates to move from an aquatic environment to land. Most species have an aquatic larval, or tadpole, stage that metamorphoses into a terrestrial adult, but a few species spend their entire life in water. Amphibians are found worldwide, the majority in the tropics.

amphibious warfare Military operations directed against hostile shores and characterized by attacks launched from the sea by naval and landing forces. It has been conducted since ancient times. The Greeks attacking Troy (1200 bc) had to make a shore landing, as did the Persian invaders of Greece prior to the Battle of Marathon (490 bc). The British-led landings at Gallipoli (1915) were the main amphibious assault in World War I. The Allies of World War II found amphibious tactics essential in the island-hopping Pacific campaign and in the famous D-Day of the Normandy campaign, which still ranks as the greatest amphibious assault in history. Amphibious warfare’s greatest advantage is its mobility and flexibility; its greatest limitation is that the attacker must start from nothing to build up strength ashore. Modern amphibious forces attempt to overcome this by fielding larger and more efficient landing vessels and also by using helicopters and short-takeoff and -landing airplanes to deploy troops beyond the hostile shore.

amphibole Vam-fs-.boH Any of a group of common rock-forming hydrous silicate minerals. Amphiboles occur in many igneous rocks as minor and major constituents and form the major component in many gneisses and schists. Some highly fibrous forms are collectively called ASBESTOS.

amphibole asbestos Collective term for three highly fibrous (asbestiform) varieties of amphibole: crocidolite, amosite, and actinolite. All have long, silky to splintery fibres with appreciable tensile strength and are of economic importance as asbestos.

amphibolite Vam-'fi-bo-.llA Igneous or metamorphic rock composed largely or dominantly of amphibole minerals. For igneous rocks, the term homblendite is usually used and is more restrictive; hornblende is the most common amphibole. Metamorphic amphibolites are more widespread and

variable than igneous ones. Typically, they are medium- to coarse-grained and are composed of hornblende and plagioclase. Basic igneous rocks such as basalts and gabbros (see acid and basic rocks) can be the parent rocks of amphibolite.

amphibolite facies \'fa-shez\ One of the major divisions of the mineral facies classification of metamorphic rocks, encompassing rocks that formed under conditions of moderate to high temperatures (950°F, or 500°C, maximum) and pressures. Less-intense temperatures and pressures form rocks of the epidote-amphiboute facies, and more-intense temperatures and pressures form rocks of the granulite facies. Amphibole, diopside, epidote, plagioclase, certain types of garnet, and wollastonite are minerals typically found in amphibolite facies rocks. They are widely distributed in Precambrian gneisses and probably formed in the deeper parts of folded mountain belts.

Amphion and Zethus \'am-fe-9n... , ze-th3s\ In Greek mythology, twin sons of Zeus by the mortal Antiope. As infants the two were left to die on Mount Cithaeron, but were found and raised by a shepherd. Amphion grew up to become a great musician and singer, while Zethus became a hunter and herdsman. According to legend, they built the city of Thebes

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after the stone blocks arranged themselves into walls at the sound of Amphion’s lyre. Amphion became king of Thebes, and he married Niobe, with whom he had six sons and six daughters. When their children were killed by the gods, he committed suicide.

amphioxus \,am-fe-'ak-s3s\ or lancelet Vlan-sl3t\ Any of certain small marine chordates (invertebrate subphylum Cephalochordata) found widely on tropical and subtropical coasts and less commonly in temperate waters. Seldom more than 3 in. (8 cm) long, they resemble small, slender fishes without eyes or a definite head. They are grouped in several species in two genera (Branchio stoma or Amphioxus, and Epigonichthyes or Asymmetron). They spend much of their time buried in gravel or mud on the ocean bottom, though they are able to swim, and feed by filtering food particles from water passing through their gill slits. They have no brain or distinct heart.

Amphipolis \am-'fi-p3-l3s\ Ancient city, eastern Macedonia, near the mouth of the Struma River. Amphipolis was a strategic transportation centre, controlling the bridge over the river and the route from northern Greece to the Dardanelles. Colonized by Athens in 437 bc, it was taken by Sparta in 424 bc. It soon received its independence, only to be taken by Philip II of Macedon in 358 bc. Later, under Roman rule, it was the headquarters of the Roman governor of Macedonia.

amphitheater Freestanding, open-air round or oval structure with a

central arena and tiers of concentric seats. The amphitheater originated in ancient Italy (Etruria and Campania) and reflects the entertainment forms popular there, including gladiatorial games and contests of animals with one another or of men with animals. The earliest extant amphitheater is one built at Pompeii (c. 80 bc). Examples survive throughout the former provinces of the Roman empire, the most famous being Rome’s Colosseum.

amplifier Device that responds to a small input signal (voltage, current, or power) and delivers a larger output signal with the same waveform features. Amplifiers are used in radio and television receivers, high-fidelity audio equipment, and computers. Amplification can be provided by electromechanical devices (e.g., transformers and generators) and vacuum tubes, but most electronic systems now employ solid-state microcircuits. One amplifier is usually insufficient, so its output is fed into a second, whose output is fed to a third, and so on, until the output level is satisfactory.

amplitude modulation See AM

amputation Removal of any part of the body, usually surgical removal of part or all of a limb. Congenital amputation means lack of a limb at birth (see agenesis). Surgical amputation may be a lifesaving measure to prevent excessive blood loss from injury or to check the spread of infection, gangrene, or malignant soft-tissue or bone tumours. Reconstructive surgery, prompt treatment with blood and plasma, and rehabilitation have made amputation rarer than in the past. Prostheses reduce handicaps for amputees, whose surgery may have been designed with a prosthesis in mind.

‘Amr ibn al-'As Vam-or-.ib-on-ol-'asV (d. 663, Al-Fustat, Egypt) Arab conqueror of Egypt. After accepting Islam (c. 630), he led a force to Oman, where he converted the region’s rulers. He was a leader in the Muslim force that conquered southwestern Palestine in the 630s but gained fame when, on his own initiative, he set out to conquer Egypt, succeeding (642) after a two-year campaign. A good administrator and politician, late in his career he aided the governor of Syria, Mu'awiyah I, against c Al 1, Islam’s fourth caliph. He was rewarded with the governorship of Egypt at the beginning of the Umayyad dynasty (661).

Amritsar X.om-'rit-sorV Massacre of (1919) Incident in which British troops fired on a crowd of Indian protesters. In 1919 the British government of India enacted the Rowlatt Acts, extending its World War I emergency powers to combat subversive activities. On April 13 a large crowd gathered at Amritsar in the Punjab to protest the measures; troops opened fire, killing about 379 and wounding some 1,200. The massacre permanently scarred relations between India and Britain and was the prelude to Mohandas K. Gandhi’s noncooperation movement of 1920-22.

Amsterdam City (pop., 2005 est.: city, 739,295; metro, area, 1,017,332), western Netherlands. It lies at the head of the IJsselmeer. It is the nominal capital of The Netherlands, whose seat of government is at The Hague. Originally a fishing village, it received its charter as a town in 1306. It joined the Hanseatic League in 1369 and grew steadily in the 14th and 15th centuries. After the decline of Antwerp at the end of the 16th

century, Amsterdam became the source of growing Dutch commercial and naval power. It was the centre for the Dutch East India and West India companies and became the leading trade metropolis of Europe. It became

part of the Kingdom of Holland, which entered the Kingdom of the Netherlands in 1815. After suffering a partial decline in the 18th century, its prosperity increased when it became connected by canal to the North Sea in the late 19th century. It was occupied by Germany in World War II. After the war Amsterdam became known as a place of tolerance and liberalism. The city is now a major European port and a hub for international finance and trade.

Amtrak formally National Railroad Passenger Corp. Federally supported corporation that operates nearly all intercity passenger trains in the U.S. It was established by Congress in 1970 in the face of private railroads' heavy financial losses. Routes were cut back severely, with service maintained only in highly populated areas and between the largest cities. Amtrak pays the railroads to run passenger trains and compensates them for the use of tracks and terminals. Amtrak bears all administrative costs and manages scheduling, route planning, and ticket sales. Despite income from tickets and mail-carrying services, Amtrak requires federal support to cover its operating costs. See also Conrail; Railway Express Agency.

Amu Darya Va-mii-'dar-yoN ancient Oxus River River, Central Asia. It is one of the longest rivers in Central Asia, 1,578 mi (2,540 km) long measured from the remotest sources of the Panj River; its other headstream is the Vakhsh. It flows west-northwest to its mouth on the Aral Sea. It forms part of Afghanistan's borders with Tajikistan, Uzbekistan, and Turkmenistan and part of Uzbekistan's border with Turkmenistan.

Amundsen Va-mun-sonV, Roald (Engelbregt Gravning) (b. July 16, 1872, Borge, near Oslo, Nor. — disappeared June 18, 1928?, Arctic Ocean) Norwegian explorer, leader of the first group to reach the South Pole. In 1897 he took part in a Belgian expedition that was the first to winter in the Antarctic. In 1903-05 he was the first to navigate the Northwest Passage. He planned an expedition to the North Pole, but, after learning that Robert E. Peary had reached that goal, he set off for the South Pole in 1910. He prepared his trip carefully and in October 1911 set out with four men, 52 dogs, and four sledges. He reached the South Pole in December 1911, one month before Robert Falcon Scon's ill-fated attempt. He returned to Norway and established a successful shipping business. In 1926 he and Umberto Nobile (1885-1978) passed over the North Pole in a dirigible. Amundsen disappeared in 1928 while flying to rescue Nobile from a dirigible crash.

Amundsen Va-mon-sonV Gulf Southeastern extension of the Beaufort Sea of the Arctic Ocean. Extending about 250 mi (400 km), the gulf is bordered by Victoria Island on the east and separates Banks Island (north) from the Canadian mainland (south). In 1850 the gulf was entered from the west by the British explorer Robert McClure. It is named for Roald

Amundsen.

Amur \a-'mur\ River Chinese Heilong Vha-Tung\ Jiang or Hei-

lung Chiang River, northeastern Asia. The Amur proper begins at the confluence of the Shilka and Argun rivers and is 1,755 mi (2,824 km) long. It flows east-southeast along the Russian-Chinese border to Khabarovsk, Siberia, then northeast across Russian territory to empty into the Tatar Strait. Among its tributaries are the Zeya, Bureya, and Ussuri rivers. From the 1 8th century, Russians have settled to the north of the river and Chinese to the south, a situation which at times has provoked border clashes.

amygdule \3-'mig-,dyul\ Secondary deposit of minerals found in a rounded, elongated, or almond-shaped cavity in volcanic rock. The cavities (vesicles) were created by the expansion of gas bubbles or steam within lava. Because gas bubbles tend to rise through the lava, amyg-

Roald Amundsen, 1 923.

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dules are most common near the tops of flows. Many minerals have been found as amygdules, including some spectacular museum specimens of ZEOLITES.

amyotrophic lateral sclerosis (ALS) \ 1 a- I mI-3- , tro-fik...skb- , rosos\ or Lou Gehrig disease Degenerative nervous-system disorder causing muscle wasting and paralysis. The disease usually occurs after age 40, more often in men. Most victims die within two to five years from respiratory muscle atrophy. ALS affects motor neurons; the muscles they control become weak and atrophied, with debility usually beginning in the hands and creeping slowly up to the shoulders. The lower limbs become weak and spastic. Variants include progressive muscular atrophy and progressive bulbar palsy. In 1993 the defective gene that accounts for 5-10% of cases was discovered; it produces an ineffective version of an enzyme that neutralizes free radicals, which destroy motor neurons.

An Hyang See An Yu

An Lushan Van-'lii-'shanV Rebellion Rebellion beginning in 755 in China led by An Lushan (703-757), a general of non-Chinese origin. An Lushan rose through the ranks of the Tang-dynasty army in the 740s, becoming a military governor and a favourite of the emperor, Xuanzong. In 755 he turned his troops on the eastern capital city, Luoyang, and after taking it he proclaimed himself emperor. Six months later his forces took Chang' an, the western capital. He was murdered in 757, and the rebel-

lion was put down in 763. The Tang government was much weakened, however, and the second half of the Tang dynasty and the subsequent Five Dynasties period were troubled by chronic warlordism.

An Yu \'an-'yu\ or An Hyang Van-'hyaq\ (b. 1243 — d. 1306) Korean Neo-Confucian scholar and educator. In 1287 he accompanied King Chungnyol to the Mongol court in Beijing (Peking), where he encountered the texts of Zhu Xi. Returning to Korea, An Yu used Neo-Confucian thought as the basis for promoting education. He helped reconstitute the National Academy and established a state treasury for national education. Eventually he became director of the Munmyo, the Korean national shrine to culture. Known as an opponent of Son (Zen) Buddhism in Korea, he was the most famous Confucian scholar of his era. See also Neo-Confucianism.

Anabaena \ l an-3- , be-no\ Genus of blue-green algae (cyanobacteria). Found as plankton in shallow water and on moist soil, they occur in both solitary and colonial forms and are capable of nitrogen fixation. In northern latitudes in summer, extensive growth of Anabaena may form water blooms that remain suspended instead of forming a surface scum. A toxic substance produced is fatal to cattle and other animals if present in drinking water in sufficient concentration.

Anabaptist Member of a movement of the Protestant Reformation characterized by adult baptism. Anabaptists held that infants were not punishable for sin because they had no awareness of good and evil and thus could not yet exercise free will, repent, and accept baptism. Denying the validity of infant baptism, they accepted adult baptism, which was regarded as a second baptism by those outside the group who identified them as Anabaptists (from the Greek for rebaptizers). Confident of living at the end of time, early Anabaptists sought to restore the institutions and spirit of the primitive church. The first adult baptisms took place outside Zurich in early 1525. Most Anabaptists were pacifists and refused to swear civil oaths. Thomas MOntzer advocated a more violent eschatology that called for the overthrow of the rich by the poor and was executed after leading the Thuringian peasant revolt (1525). Another group of Anabaptists, led by John of Leiden, took control of the city of Munster and sought to establish the millennial kingdom. Their excesses led to their violent suppression in 1535 and further persecution and martyrdom of the Anabaptists. Many Anabaptists settled in Moravia, where they stressed the community of goods modeled on the primitive church at Jerusalem. This branch continues as the Hutterite movement, primarily in the western U.S. and Canada. Increasingly persecuted throughout Europe, Anabaptists in the Netherlands and northern Germany rallied under the leadership of Menno Simonsz. and survive as the Mennonites.

anabolic \,a-n9-'ba-lik\ steroid Steroid hormone that increases tissue growth. Anabolic steriods are given to elderly or postoperative patients to promote muscle growth and tissue regeneration. Unsupervised use by athletes to build muscle and improve strength can have serious harmful effects, including coronary heart disease, sexual and reproductive disor-

ders, immunodeficiencies, liver damage, stunted growth, aggressive behaviour, susceptibility to connective-tissue injury, and (in females) irreversible masculinization.

Anacletus \,an-3-'klet-9s\ II orig. Pietro Pierleoni (b. Rome — d.

Jan. 25, 1138, Rome) Antipope (1130-38). Named a cardinal at Rome in 1116, he was elected pope by a majority of cardinals in 1130, while a minority created a schism by choosing Innocent II. Anacletus forced the rival pope to flee to France, where Innocent was supported by a church council and, especially, by Bernard of Clairvaux. Innocent's supporters, including the Holy Roman and Byzantine emperors, invaded Italy in an unsuccessful effort to restore him. A second expedition in 1136 eroded support for Anacletus, who died before the issue was resolved by the submission of his successor to Innocent.

anaconda Either of two South American snake species in the genus Eunectes (family Boidae) that constrict their prey. The heavily built giant anaconda, or great water boa, is usually not more than 16 ft (5 m) long but can be longer than 24 ft (7.5 m), rivaling the largest pythons in length. The yellow anaconda is much smaller. Typically dark green with alternating oval black spots, the giant anaconda lives along tropical rivers east of the Andes and in Trinidad. It kills at night by lying in wait in water; it constricts prey as large as young pigs or caimans and occasionally forages in trees for birds. It may bear 75 live young at a time.

Anacreon or Anakreon \3-'nak-re-3n\ (b. c. 582 bc, Teos, Ionia — d. c. 485) Last great lyric poet of Asian Greece. Only fragments of his poetry have survived. Though he may have written serious poems, the poems quoted by later writers are chiefly in praise of love, wine, and revelry. His sentiments and style were widely imitated, and the anacreontic metre in poetry was named for him.

Anadolu See Anatolia

Anaheim City (pop., 2000: 328,014), southwestern California, U.S. Lying on the plain of the Santa Ana River 25 mi (40 km) southeast of Los Angeles, it was founded by German immigrants in 1857 as a cooperative agricultural community. After 1950 its citrus groves and vineyards had all but disappeared in the Los Angeles-Orange Co. urban-industrial expansion. Walt Disney's first amusement park, Disneyland, opened there in 1955. Today it is a prominent convention site.

anal canal End portion of the alimentary canal, distinguished from the rectum by the transition from an internal mucous membrane layer to one of skinlike tissue and by its narrower diameter. Waste products move from the rectum to the anal canal. The human anal canal is 1-1.5 in. (2.5^4 cm) long and has three parts: upper, with longitudinal folds (rectal columns); lower, with involuntary and voluntary constrictive muscles (sphincters) to control discharge of feces; and the anal opening itself. Enlargements of the ends of rectal and anal veins are called hemorrhoids.

Analects See Lunyu

analgesic \,an-9l-'je-zik\ Drug that relieves pain without blocking nerve impulse conduction or markedly altering sensory function (see nervous system). Two classes are defined by the type of pain-relieving action. Opi-

oids (opiates and synthetic narcotics; see opium) act on brain receptors to inhibit pain impulses. They may be used for short- or long-term pain relief, usually by prescription, but carry a risk of drug addiction. Non-opioids, used mostly for short-term relief and modest pain, are available without prescription. They include NSAIDs (including aspirin and ibuprofen) and acetaminophen; all act by inhibiting synthesis of prostaglandins, molecules involved in the peripheral perception of pain.

analog computer Computer in which continuously variable physical quantities, such as electrical potential, fluid pressure, or mechanical motion, are used to represent (analogously) the quantities in the problem to be solved. The analog system is set up according to initial conditions and then allowed to change freely. Answers to the problem are obtained by measuring the variables in the analog model. Analog computers are especially well suited to simulating dynamic systems; such simulations

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may be conducted in real time or at greatly accelerated rates, allowing experimentation by performing many runs with different variables. They have been widely used in simulating the operation of aircraft, nuclear power plants, and industrial chemical processes. See also digital computer.

analysis In chemistry, the determination of the properties and composition of samples of materials; qualitative analysis establishes what is there, and quantitative analysis measures how much. A large body of systematic procedures (analytical chemistry) has evolved in close association with other branches of the physical sciences since their beginnings. A sample of a single compound may be analyzed to establish its elemental composition (see element, molecular weight) or molecular structure; many measurements use spectroscopy and spectrophotometry. A mixed sample is usually analyzed by separating, detecting, and identifying its components by methods that depend on differences in their properties (e.g., volatility, mobility in an electric or gravitational field, distribution between liquids that do not mix). The many types of chromatography are increasingly useful, particularly with biological and biochemical samples.

analysis Field of mathematics that incorporates the methods of algebra and calculus — specifically of limits, continuity, and infinite series — to analyze classes of functions and equations having general properties (e.g., differentiability). Analysis builds on the work of G.W. Leibniz and Isaac Newton by exploring the applications of the derivative and the integral. Several distinct but related subfields have developed, including the calculus of variations, differential equations, Fourier analysis (see Fourier transform), complex analysis, vector and tensor analysis, real analysis, and FUNCTIONAL ANALYSIS. See also NUMERICAL ANALYSIS.

analytic geometry Investigation of geometric objects using coordinate systems. Because Rene Descartes was the first to apply algebra to

geometry, it is also known as Cartesian geometry. It springs from the idea that any point in two-dimensional space can be represented by two numbers and any point in three-dimensional space by three. Because lines, circles, spheres, and other figures can be thought of as collections of points in space that satisfy certain equations, they can be explored via equations and formulas rather than graphs. Most of analytic geometry deals with the conic sections. Because these are defined using the notion of fixed distance, each section can be represented by a general equation derived from the DISTANCE FORMULA.

analytic philosophy Philosophical tradition that emphasizes the logical analysis of concepts and the study of the language in which they are expressed. It has been the dominant approach in philosophy in the English-speaking world from the early 20th century. With respect to its problems, methods, and style, it is often contrasted with Continental philosophy, though the significance of the opposition has been widely challenged. Analytic philosophers have differed regarding the nature of so-called “ordinary” language and the methodological value of appeals to ordinary usage in the logical analysis of concepts. Those known as formalists hold that, because ordinary language is potentially a source of conceptual confusion, philosophy and science should be conducted in a logically transparent formal language based on modern mathematical, or symbolic, logic. Those known as informalists reject this view, arguing that attempts to “improve” ordinary language in this way inevitably oversimplify or falsify it, thereby creating conceptual confusion of just the sort that the formalists are concerned to avoid. Three figures conventionally recognized as founders of the tradition are Gottlob Frege, G.E. Moore, and Bertrand Russell. Other major figures include Ludwig Wittgenstein, A.J. Ayer, Rudolf Carnap, J.L. Austin, W.V.O. Quine, and David Lewis (1941–2001). See also logical positivism; Vienna Circle.

analytic psychology Psychoanalytic method of Carl Jung as he distinguished it from that of Sigmund Freud. Jung attached less importance than did Freud to the role of childhood sexual conflicts in the development of neurosis. Moreover, he defined the unconscious to include both the individual’s own unconscious and that inherited, partly in the form of archetypes, from his or her ancestors (the “collective unconscious”). He classified people into introvert and extravert types and further distinguished them according to four primary functions of the mind — thinking, feeling, sensation, and intuition — one or more of which predominated in any given person.

analytic-synthetic distinction In both logic and epistemology, the distinction (derived from Immanuel Kant) between statements whose predicate is included in the subject (analytic statements) and statements whose predicate is not included in the subject (synthetic statements). Some philosophers prefer to define as analytic all statements whose denial would be self-contradictory, and to define the term synthetic as meaning “not analytic.” The distinction, introduced by Kant in The Critique of Pure Reason , aroused extensive debate in the mid-20th century, particularly in view of objections raised by W.V.O. Quine.

anamorphosis \ l an-o-m6r-'fo-sis\ Drawing or painting technique that gives a distorted image of the subject when seen from the usual viewpoint, but when viewed from a particular angle or reflected in a curved mirror shows it in true proportion. Its purpose is to amuse or mystify. It

was a curious by-product of the discovery of perspective in the 14th- 15th century and was regarded as a display of technical virtuosity. The first examples appear in Leonardo da Vinci’s notebooks.

Ananda Va-non-doV (fl. 6th century bc, India) First cousin and disciple of the Buddha. A monk who served as the Buddha’s personal attendant, he became known as the “beloved disciple.” It was Ananda who persuaded the Buddha to allow women to become nuns. By tradition, he was the only intimate disciple of the Buddha who had not attained enlightenment before his master’s death; he attained that state just before the first Buddhist Council (c. 544 or 480 bc), when he recited from memory the Sutta Pitaka. He is represented as the author of several Buddhist discourses.

anaphylaxis \,an-9-fi-'lak-sis\ Severe, immediate, potentially fatal bodily reaction to contact with a substance (antigen) to which the individual has previously been exposed. Often triggered by antiserum, antibiotics, or insect stings, the reaction’s symptoms include skin flushing, bronchial swelling (with difficulty breathing), and loss of consciousness. Shock may follow. Milder cases may involve hives and severe headache. Treatment, consisting of injection of epinephrine, followed by antihistamines, cortisone, or similar drugs, must begin within minutes. Anaphylaxis may be caused by extremely small amounts of antigen.

anarchism Van-or-.kiz-omV Political theory holding all forms of government authority to be unnecessary and undesirable and advocating a society based on voluntary cooperation and free association of individuals and groups. The word was used only pejoratively until Pierre-Joseph Proudhon, now regarded as the founder of anarchism, adopted it in What is Property? (1840). The anarchist Mikhail Bakunin clashed with Karl Marx at the First International; when it was dissolved in 1872, Bakunin’s followers retained control of workers’ organizations in Latin countries such as Spain and Italy. Even anarchists who believed that the transition to a government-free society required violent revolution disagreed on the nature of the transition. Anarcho-SYNDICAUSM, which developed in the late 1880s, emphasized labour unions (syndicats) and called for general strikes to paralyze the state. In the 19th and 20th centuries, anarchism also inspired experimental communities, including New Lanark in Britain and Brook Farm in the U.S. During the early months of the Spanish Civil War, anarchist militias were in virtual control of much of eastern Spain, where they established hundreds of anarchist collectives. Suppressed as an organized movement by fascism in the 1930s, anarchism reemerged in the 1950s and ’60s through its influence on the civil rights movement and the student movements in the U.S. and Europe. The radical ECOLOGY movement in the 1970s also was inspired by anarchist ideas. Beginning in 1999, anarchist-led street demonstrations against the World Bank and International Monetary Fund received unprecedented publicity and inspired new anarchist groups, periodicals, and Internet sites. Anarchist themes are reflected in the work of many 20th-century artists, writers, and musicians, including Pablo Picasso, the American poets of the Beat movement, the Spanish Surrealist filmmaker Luis Bunuel, and the American composer John Cage.

Anasazi \,a-n3-'sa-ze\ culture North American Indian civilization that developed from c. ad 100 to historic times, centring on the area where the present-day boundaries of the U.S. states of Arizona, New Mexico, Colorado, and Utah intersect. Anasazi is the Navajo word for “Ancient Enemy”; the Hopi prefer the term Hisatsinom, meaning “Ancient People.” Anasazi is the term most commonly used to refer to the ancestors of contemporary Pueblo Indian peoples. Anasazi civilization is customarily

divided into several periods: Basket Maker (ad 100-500), Modified Basket Maker (500-700), Developmental Pueblo (700-1050), Classic Pueblo (1050-1300), Regressive Pueblo (1300-1700), and Modern Pueblo (1700-the present). As among present-day Pueblo peoples, religion in the Anasazi culture was highly developed and centred on rites partly conducted in underground circular chambers called kivas. The best-known Anasazi ruins are the cliff dwellings at Mesa Verde (Colo.) and Chaco Canyon (N.M.).

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Anastasia Russian Anastasiya Nikolayevna (b. June 18, 1901, Peterhof, Russia — d. July 16/17, 1918, Yekaterinburg) Grand duchess of Russia and youngest daughter of Tsar Nicholas II. She was executed at age 17 with the other members of her immediate family by the Bolsheviks in the Russian Revolution of 1917. After the executions several women outside Russia claimed her identity, making her the subject of periodic popular conjecture and publicity. Some also claimed to be heir to the Romanov fortune held in Swiss banks. The most famous was Anna Anderson (d. 1984), a Pole married to a U.S. history professor; her claim was finally rejected in 1970, and later genetic tests proved there was no connection between Anderson and the Romanovs.

Anastasius \,an-3-'sta-zh3s\ I (b. 430?, Dyrrhachium, Epirus Vetus — d. July 9, 518, Constantinople) Byzantine emperor (491-518). Originally a bodyguard to Zeno, he succeeded Zeno as emperor and married his widow. Anastasius reformed the monetary and taxation systems and expelled rebel tribes from Constantinople, building a wall to protect the capital against raiders. He recognized Theodoric's rule in Italy (497) but later sent a fleet to ravage the Italian coast. War with Persia (502-5) ended when he agreed to pay tribute to the Persian king. Anastasius accepted the Monophysite doctrine, a stand that caused unrest in Byzantium but fostered peace with Egypt and Syria.

Anath \'an-ath\ Chief western Semitic goddess of love and war, sister and helpmate to Baal, whom she retrieved from the land of the dead. One of the best-known of Canaanite deities, she was famous for her youthful vigour and ferocity in battle. In Egypt she was depicted nude, holding flowers and standing on a lion. During the Hellenistic Age, Anath and Astarte were merged into Atargatis.

Anatolia or Asia Minor Turkish Anadolu X.a-na-'do-liiN Peninsula forming the western extremity of Asia. It is bounded by the Black Sea to the north, the Mediterranean Sea to the south, and the Aegean Sea to the west. Its eastern boundary is generally marked by the Anti-Taurus Mountains. Anatolia is roughly contiguous with the Asian portion of the modern Republic of Turkey. Because of its location at the point where Asia and Europe meet, it has long been the scene of numerous migrations and conquests. It was the original location of the kingdom of Hittites (c. 1700-1180 bc). Later, Indo-European peoples, possibly Thracian, established the Phrygian kingdom. In the 6th century bc the Persian Achaemenian

dynasty came to rule the area; it was conquered by Alexander the Great in 334 bc. Beginning in the 1st century bc, the area was absorbed into the Roman Republic and Empire. When the empire split in ad 395, Anatolia became part of the Byzantine Empire. The area endured invasions by Arabs, Turks, Crusaders, Mongols, and the Turkic army of Timur before the Ottoman Empire established full control in the 15th century. From 1923 its history was that of modern Turkey.

Anatolian languages Branch of the Indo-European language family spoken in Anatolia in the 2nd-lst millennia bc. The attested Anatolian languages are Hittite, Palaic, Luwian (Luvian), Hieroglyphic Luwian, Lycian, and Lydian. Hittite, by far the most copiously attested of the group, is known chiefly from a vast archive of cuneiform tablets found in 1905 at Hattusas (now Bogazkoy, in north-central Turkey), the capital of the Hittite empire; Hittite texts date from the 16th to 13th century bc. By the late Roman or early Byzantine period at the latest, Anatolian languages had all become extinct. Several non-Indo-European languages of ancient Anatolia, all known from cuneiform texts, are also sometimes considered Anatolian languages: Hattie, spoken in central Anatolia before the coming of the Hittites and known solely from words and texts preserved by Hittite scribes; Hurrian, spoken in the 2nd millennium bc in northern Mesopotamia and southeastern Anatolia; and Urartian (Urartean), known from northwestern Anatolian texts of the 9th-7th centuries bc.

anatomy Biological field that deals with bodily structures as revealed by dissection. Herophilus first laid the factual groundwork for gross anatomy, the study of structures large enough to see without a microscope. Galen’s ideas were the authority for anatomy in Europe until Andreas Vesauus’s methods placed it on a firm foundation of observed fact. The microscope permitted the discovery of tiny structures (e.g., capillaries and cells), the subject of microscopic anatomy. Crucial advances in this area — including the microtome, which slices specimens into extremely thin sections, and staining — led to the new fields of cytology and histology. Electron microscopy opened up the study of subcellular structures, and X-ray diffraction gave rise to the new subspecialty of molecular anatomy.

Comparative anatomy compares similar structures in different animals to see how they have changed with evolution.

Anaxagoras \,an-ak-'sag-3-r3s\ (b. c. 500, Clazomenae, Anatolia — d. c. 428 bc, Lampsacus) Greek philosopher. Though only a few fragments of his writings have survived, he is remembered for his cosmology and for his discovery of the true cause of eclipses. His cosmology grew out of the efforts of earlier pre-Socratics to explain the physical universe in terms of a single element. The most original aspect of his system was his doctrine of nous (“mind,” or “reason”), according to which the cosmos, including all living things, was created by mind in a process of attraction of “like to like”; mind also accounts for the power of living things to extract nourishment from surrounding substances.

Anaximander Vo-'nak-so-.man-dorX (b. 610 bc, Miletus — d. 546/545 bc) Greek philosopher, often called the founder of astronomy. He appar-

ently wrote treatises on geography, astronomy, and cosmology that survived for several centuries and made a map of the known world. He was the first thinker to develop a cosmology. A rationalist, he prized symmetry and used geometry and mathematical proportions to help map the heavens; his theories thus departed from earlier, more mystical conceptions and foreshadowed the achievements of later astronomers. Whereas earlier theories had suggested Earth was suspended or supported from elsewhere in the heavens, Anaximander asserted that Earth remained unsupported at the centre of the universe because it had

Anaximander, represented with a sundial, mosaic, 3rd century ad; in the Rhineland Museum, Trier, Ger.

BY COURTESY OF THE LANDESMUSEUM, TRIER, GER.

no reason to move in any direction.

Anaximenes X.an-ak-'sim-o-.nezN (fl. c. 545 bc) Greek philosopher of nature. With Thales and Anaximander, he is one of three Milesian thinkers (see Miletus) traditionally considered the first philosophers of the Western world. He defined the essence of matter as aer (“air”) and explained the densities of various types of matter in terms of varying degrees of condensation of moisture. His writings no longer exist except as quoted by later authors.

ANC See African National Congress

ancestor worship Religious beliefs or practices that involve addressing prayers or offerings to the spirits of dead relatives. It existed among the ancient Greeks, other Mediterranean peoples, and the ancient Europeans; it also plays a major role in traditional African religions. The dead are related to the family, clan, tribe, or village; mythical ancestors may be included. They may be friendly, or they may be displeased and require propitiation. Commemorative ceremonies are sometimes held at graves or monuments and may include prayers, offerings, sacrifices, and festivals of honor. Worship of individual ancestors is common; it may be combined with communal forms of worship, as in the case of the Roman emperor cult. An ancestor whose deeds are heroic may attain the status of a god. In China and Japan, ancestor worship (more accurately, ancestor reverence) has declined with the decline in the size and importance of kinship groups.

Anchorage Seaport, largest city (pop., 2000: 260,283), and chief commercial centre of Alaska, U.S. It lies at the head of Cook Inlet near the base of the Kenai Peninsula. It was founded in 1914 as a construction camp for the building of a railroad to Fairbanks. It became a key aviation and defense centre in World War II and is now a regular stop on air routes from the U.S. to East Asia. Anchorage experienced rapid population growth in the late 20th century. In 1964 a severe earthquake caused a number of deaths and extensive property damage.

anchovy Any of more than 100 species of schooling saltwater fishes (family Engraulidae) related to the herring. Anchovies are distinguished by a large mouth, almost always extending behind the eye, and by a pointed snout. Most species live in shallow tropical or warm temperate seas, where they often enter brackish water around river mouths. Adults are 4-10 in. (10-25 cm) long. Temperate species such as the northern and

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European anchovies are important food fishes; tropical species such as the tropical anchovy, or anchoveta, are important bait fishes. See also SCHOOLING BEHAVIOUR.

ancien regime \a n s-ya n -ra-'zhem\

(French: “old order”) Political and social system of France prior to the French Revolution. Under the regime, everyone was a subject of the king of France as well as a member of an estate and province. All rights and status flowed from the social institutions, divided into three orders: clergy, nobility, and others (the Third Estate). There was no national citizenship.

Ancona Seaport (pop., 2001: 100,402), capital of the Marche region, central Italy. Founded by colonists from Syracuse c. 390 bc, it was taken by Rome in the 2nd century bc. It became a flourishing port particularly favoured by Trajan, who enlarged the harbour. It was attached to the Holy Roman Empire in the 12th century; in the 16th century it came under papal protection, which was largely maintained until Ancona became part of Italy in 1861. It underwent severe bombing in World War II, but many notable Roman and medieval landmarks survive.

Anda See Altan

Andalusia X.an-do-lu-'se-oV Spanish Andalucia Autonomous community (pop., 2001: 7,357,558) and historic region, southern Spain. It occupies an area of 33,821 sq mi (87,597 sq km); the capital is Sevilla. It is traversed by mountain ranges, including the Sierra Morena and Sierra

Nevada; its main river is the Guadalquivir. Andalusia has a long history of inhabitation: by the Phoenicians (9th century bc), the Carthaginians (5th century bc), and the Romans (3rd century bc). The Arabic name Al-Andalus was originally applied by the Moors to the whole Iberian Peninsula. When the Umayyad dynasty established its court at Cordoba, this area became the peninsula's intellectual and political centre. It returned to Spanish Christian rule in 1492 and remained a province until divided in 1833 into the eight modern provinces. A mining and agricultural region, Andalusia also features beaches along the Costa del Sol that attract the tourist trade.

Andaman and Nicobar \'an-d3-m3n... , nik-6- I bar\ Islands Union territory (pop., 2001: 356,152), India. It consists of two groups of islands in the Bay of Bengal about 800 mi (1,300 km) east of the Indian subcontinent and Sri Lanka; the total area is 3,185 sq mi (8,249 sq km). The chief islands are North Andaman, Middle Andaman, and South Andaman (known collectively as Great Andaman), and Little Andaman. The Nicobar group includes Car Nicobar, Camorta (Kamorta) and Nancowry, and Great Nicobar. Most of the population lives in the Andaman group. Port Blair on South Andaman, established by the British in 1858, is the territorial capital.

Andaman Sea Sea, eastern extension of the Bay of Bengal. Bounded by the Andaman and Nicobar Islands, Myanmar, the Malay Peninsula, and the Strait of Malacca and Sumatra, it covers some 308,000 sq mi (798,000 sq km). Trading vessels have plied the sea since ancient times. Part of the early coastal trade route between India and China, from the 8th century it formed a route between India (and Sri Lanka) and Myanmar. Its largest modem ports are George Town (Malaysia) and Yangon (Myanmar). A large earthquake-generated tsunami in 2004 inundated many of the sea's coastal areas.

Andania mysteries Ancient Greek mystery cult, held in honor of the goddess Demeter and her daughter Kore (Persephone) at Andania in Messenia. It was performed by "holy ones" of both sexes from various tribes. Initiation was open to all. Costumes were plain and inexpensive, except for those costumed as deities. There was a procession, and a pageant or drama may have been performed; sacrifices were made to several deities before the main ceremony.

Andean bear See spectacled bear

Andean civilization Complex of aboriginal cultures that evolved in the Andean region (see Andes Mountains) of western South America before the arrival of the Spanish coNQUiSTADORes in the 16th century. Unlike the peoples of the Mesoamerican civilization to the north, none of the aboriginal Andean peoples developed a system of writing, though the

Inca devised a sophisticated system of recording numbers. In its level of cultural development and technical expertise in the arts and crafts, however, this civilization constitutes a New World counterpart to those of ancient Egypt, China, and Mesopotamia. See also Chibcha; Chimu; Moche; Tiahuanaco.

Andean Geosyncline Linear trough in the Earth's crust in which rocks were deposited in South America in the Mesozoic Era (248-65 million years ago) and Cenozoic Era (65 million years ago to the present). A

complex history of volcanism, uplift, block faulting, and erosion led eventually to the present configuration of the Andes Mountains.

Andersen, Hans Christian (b. April 2, 1805, Odense, near Copenhagen, Den. — d. Aug. 4, 1875, Copenhagen) Danish writer of fairy tales. Though reared in poverty, he received a university education. In his many collections of tales, published 1835-72, he broke with literary tradition and employed the idioms and constructions of spoken language. His stories are imaginative combinations of universal elements from folk legend and include such favourites as “The Ugly Duckling” and “The Emperor’s New Clothes.” While some reveal an optimistic belief in the ultimate triumph of goodness and beauty (e.g., “The Snow Queen”), others are deeply pessimistic. Part of what makes his tales compelling is the way they identify with the unfortunate and outcast. He also wrote plays, novels, poems, travel books, and several autobiographies.

Anderson, Dame Judith orig. Frances Margaret Anderson

(b. Feb. 10, 1898, Adelaide, S.Aus., Australia — d. Jan. 3, 1992, Santa Barbara, Calif., U.S.) Australian-born U.S. actress. She made her stage debut in Sydney in 1915 and first appeared in New York City in 1918. She was noted for roles such as Lavinia in Mourning Becomes Electra (1932), Gertrude in Hamlet (1936), Lady Macbeth in Macbeth (1937, 1941), and the title role in Medea (1947). She appeared in over 25 films, usually playing an evil or sinister figure, including Mrs. Danvers in Rebecca (1940) and Ann Treadwell in Laura (1944).

Anderson, Elizabeth Garrett (b. June 9, 1836, Aldeburgh, Suffolk, Eng. — d. Dec. 17, 1917, Aldeburgh) British physician. Denied admission to medical schools, she studied privately with physicians and in London hospitals and was the first woman licensed as a physician in Britain (1865). Appointed general medical attendant to St. Mary’s Dispensary (1866), later the New Hospital for Women, she created a medical school for women, and in 1918 the hospital was named for her.

Anderson, Laurie (b. June 5, 1947, Wayne, 111., U.S.) U.S. performance artist. After studying at Barnard College and Columbia University, she began giving performances in New York City in 1973 while teaching art history at the City University of New York. Combining elements of music, theatre (dance, mime), film, technology, and speech, she satirized media and mass culture, using the tools they themselves provide. The pop-music success of her song “O Superman” (1980) led her to record two albums, Big Science (1982) and Mister Heartbreak (1984). Her major 1980s piece was the multimedia extravaganza United States. Other works include Stories from the Nerve Bible (1993) and a multimedia work (1999) based on Moby Dick.

Anderson, Leroy (b. June 29, 1908, Cambridge, Mass., U.S. — d. May 18, 1975, Woodbury, Conn.) U.S. composer of light orchestral music. He studied composition and German and Scandinavian languages at Harvard; fluent in nine languages, he was an army interpreter in two wars. In 1936 he began a long association with Arthur Fiedler and the Boston Pops Orchestra, and pieces such as “Syncopated Clock,” “Sleigh Ride,” “Bugler’s Holiday,” and the Irish Suite became standards.

Anderson, Lindsay (b. April 17, 1923, Bangalore, India — d. Aug. 30, 1994, near Angouleme, Fr.) English critic and director. He was a founding editor of the film magazine Sequence , and from 1948 he directed a

series of documentaries, including Thursday's Children (1955, Academy Award). He coined the term "Free Cinema" for the British cinematic movement inspired by John Osborne's play Look Back in Anger. His first feature film, This Sporting Life (1963), is a classic of the British social realist cinema. He directed several theatrical productions before making his next film. If... (1968). After directing the premieres of David Storey's plays, he went on to make such films as O Lucky Man! (1973) and The Whales of August (1987).

Anderson, Marian (b. Feb. 27, 1897, Philadelphia, Pa., U.S. — d. April 8, 1993, Portland, Ore.) U.S. singer. She was immediately recognized for the beauty of her voice and her artistry at her New York City

Anchovies (Engraulis mordax)

TOM MCHUGH -PHOTO RESEARCHERS

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debut in 1924, but the fact that she was black made a concert or opera career in the U.S. impossible. Her London debut in 1930 and tours of Scandinavia established her in Europe, where she worked exclusively until 1935. When she was denied use of Constitution Hall in Washington, D.C., by the Daughters of the American Revolution in 1939, Eleanor Roosevelt arranged for her to sing at the Lincoln Memorial, and the concert was broadcast to great acclaim. Her debut at the Metropolitan Opera, the first performance there by a black singer, took place in 1955, when she was in her late 50s.

. . , ... Marian Anderson.

Anderson, (James) Maxwell courtesy of rca records
(b. Dec. 15, 1888, Atlantic, Pa.,

U.S. — d. Feb. 28, 1959, Stamford, Conn.) U.S. playwright. He worked as a journalist before cowriting his first successful play. What Price Glory? (1924), which was followed by Saturday's Children (1927). His verse dramas Elizabeth the Queen (1930) and Mary of Scotland (1933) were later

adapted for film. He returned to prose for the satire Both Your Houses (1933, Pulitzer Prize) and the tragedy Winterset (1935), then turned to verse again for High Tor (1936), a romantic comedy. He collaborated with Kurt Weill on the musicals Knickerbocker Holiday (1938) and Lost in the Stars (1949). His last play. The Bad Seed (1954), became a successful film.

Anderson, Sherwood (b. Sept. 13, 1876, Camden, Ohio, U.S. — d. March 8, 1941, Colon, Pan.) U.S. author. Anderson was irregularly schooled. Having married, he abruptly left his family and business career to become a writer in Chicago. Winesburg, Ohio (1919), a collection of interrelated sketches and tales about the obscure lives of the citizens of a small town, was his first mature book and made his reputation. His short stories were collected in The Triumph of the Egg (1921), Horses and Men (1923), and Death in the Woods (1933). His prose style, based on every-day speech and influenced by the experimental writing of Gertrude Stein, in turn influenced such writers as Ernest Hemingway and William Faulkner.

Andersonville Village, southwest-central Georgia, U.S. It was the site of a Confederate military prison in 1 864-65 during the American Civil War. Notorious for its dreadful conditions, it provided only makeshift shelter for the Union prisoners, more than one-fourth of whom died. The Anderson-ville National Cemetery, which includes the prison site, contains the graves of 12,920 Union prisoners who perished there. In 1865 Capt. Henry Wirz, commander of the prison, was tried by a military commission and hanged. Andersonville is also the site of the National Prisoner of War Museum.

Andes Mountains Mountain system, western South America. One of the great natural features of the globe, the Andes extend north-south about 5,500 mi (8,900 km). They run parallel to the Caribbean Sea coast in Ven-ezuela before turning southwest and entering Colombia. There they form three distinct massifs: the Cordilleras Oriental, Central, and Occidental. In Ecuador they form two parallel cordilleras, one facing the Pacific and the other descending toward the Amazon River basin. These ranges con-tinue southward into Peru; the highest Peruvian peak is Mount Huascaran (22,205 ft [6,768 m]) in the Cordillera Blanca. In Bolivia the Andes again form two distinct regions; between them lies the Altiplano. Along the bor-der of Chile and Argentina, they form a complex chain that includes their highest peak, Mount Aconcagua, which reaches an elevation of 22,834 ft (6,960 m). In southern Chile part of the cordillera descends beneath the sea and forms numerous islands. The Andes are studded with a number of volcanoes that form part of the Circum-Pacific chain known as the Ring of Fire. The Andes mountain system is the source of many rivers, includ-ing the Amazon and Pilcomayo.

andesite \ , an-do- l zit\ Any member of a large family of rocks that occur in most of the world’s volcanic areas, mainly as surface deposits and to a lesser extent as dikes and small plugs. The Andes, where the name was first applied, and most of the cordillera (parallel mountain chains) of Cen-tral and North America consist largely of andesites. They also occur in abundance in volcanoes along practically the entire margin of the Pacific basin. Andesites are most often porphyritic (having distinct crystals in a fine-grained base) rocks.

Andhra Pradesh X.an-dro-prs-'deshX State (pop., 2001: 76,210,007),

southeastern India. Located on the Bay of Bengal, it is bordered by Tamil Nadu, Karnataka, Maharashtra, Chhattisgarh, and Orissa states. Covering 106,204 sq mi (275,068 sq km), it was created in 1953 and achieved its present-day form in 1960; its capital is Hyderabad. Its name derives from the Telugu-speaking Andhra people, who have long inhabited the area. Many dynasties have flourished here, dating to the 3rd century bc. The area came under British influence in the 17th century; in the 19th century the Andhras played a decisive role in the rise of Indian nationalism. The state's economy, once primarily agricultural, has become one of the most industrialized in India.

Andijon \,an-di-'jan\ or Andizhan \,an-di-'zhan\ City (pop., 1998 est.: 288,000), eastern Uzbekistan. Dating to at least the 9th century ad, it was an important trading centre in the 15th century because of its location on the Silk Road. Part of the khanate of Kokand (see Qo'qon) in the 18th century, it was captured by the Russians in 1876. The surrounding area is the most densely populated part of Uzbekistan and the country's main petroleum-producing region.

Andocides \an-'da-si-,dez\ (b. c. 440 — d. c. 390 bc) Athenian orator and politician. He went into exile (415-403 bc) after being implicated in and having informed on those responsible for the mutilation of the sacred busts of Hermes just before the Athenian expedition to Sicily. He returned after the restoration of Athenian democracy. He helped arrange a treaty with Sparta in the Corinthian War (392), but Athens rejected it and exiled him and the other ambassadors.

Andorra officially Principality of Andorra Independent coprinci-
pality, southwestern Europe. Area: 179 sq mi (464 sq km). Population (2005 est.): 74,800. Capital: Andorra la Vella. Lying on the southern

is Spanish or Andorran. Language: Cata-
lan (official). Religion: Christianity (predominantly Roman Catholic; also other Christians). Currency: euro. Andorra's independence is traditionally ascribed to Charlemagne, who recovered the region from the Muslims in ad 803. It was placed under the joint suzerainty of the French counts of Foix and the Spanish bishops of Urgel in 1278, and it was subsequently governed jointly by the Spanish bishop of Urgel and the French head of state. This feudal system of government, the last in Europe, continued until 1993, when a constitution was adopted that transferred most of the coprinces' powers to the Andorran General Council, which is elected by universal suffrage. Andorra has long had a strong affinity with Catalonia;

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its institutions are based in Catalonian law, and it is part of the diocese of Urgel (Spain). The traditional economy was based on sheep raising,

but tourism grew in importance since the 1950s and became central to Andorra's economy by the early 21st century.

Andorra la Vella \an-'d6r-3-la-'vel-ya\ Town (pop., 2001 est.: 20,800), capital of Andorra. It lies near the confluence of the Valira and Valira del Norte rivers. The town long remained relatively isolated from the outside world, but its population began to grow after World War II as tourists began arriving at the nearby sports areas. Because of its country's duty-free status, the town has become a retail shopping centre for other Europeans.

Andrada e Silva \a n -'dra-tha-e-'sil-va\, Jose Bonifacio de known as Jose Bonifacio Nzhu-'ze-.bo-ni-'fa-se-oV (b. c. 1763, Santos, Braz. — d. April 6, 1838, Niteroi) Chief architect of Brazil's independence from Portugal. Andrada was bom in Brazil but educated in Portugal, where he became a distinguished scholar. On returning to Brazil in 1819, he functioned as chief minister of the Portuguese prince regent (later the emperor Pedro I), who had fled Portugal with the rest of the royal family to escape Napoleon. Andrada was the leading intellectual advocate of independence. After Pedro I declared Brazil independent in 1822, he served as prime minister and as tutor to the child emperor Pedro II, who became an effective and enlightened monarch.

Andrassy \'an-,dra-se\ Gyula, Count (b. March 3, 1823, Kassa, Hung., Austrian Empire — d. Feb. 18, 1890, Volosco, Istria, Austria-Hungary) Hungarian politician. A follower of Kossuth Lajos, Andrassy helped lead the unsuccessful revolt of 1 848 — 49, then fled into exile until 1857. He supported the creation of the Dual Monarchy of Austria-Hungary and played a major role in negotiating the Compromise of 1 867. He served as Hungary's first prime minister (1867-71) and later as foreign minister (1871-79), in which he helped strengthen Austria-Hungary's international position. Just before resigning, he signed the fateful Austro-German Alliance (1879) that linked those two powers until the end of World War I.

Andre, Carl (b. Sept. 16, 1935, Quincy, Mass., U.S.) U.S. sculptor. The son of a draftsman for a shipbuilding firm, he attended Phillips Andover Academy and Northeastern University. He moved to New York City in 1957 and soon was producing large-scale horizontal sculptures out of steel plates, slabs of granite, styrofoam planks, bricks, and cement blocks, using a grid system based on simple mathematical principles. His work from this period was often intended to be placed directly on the gallery or museum floor; its monumental austerity was central to the Minimalist movement. Beginning in the 1970s he also experimented with large-scale wood sculpture.

Andre \'an-dre\, John (b. May 2, 1750, London, Eng. — d. Oct. 2, 1780, Tappan, N.Y., U.S.) British army officer and spy. From 1774 he was the chief intelligence officer of the British commander Henry Clinton at New York. In 1779 Andre began corresponding with Gen. Benedict Arnold, who had become disillusioned with the American cause. In 1780 he obtained Arnold's agreement to surrender the West Point fort. Andre was captured while returning to New York, and incriminating papers were found in his boot; he was found guilty of espionage and hanged.

Andrea del Sarto \an-'dra-3-del-'sar-to\ orig. Andrea d'Agnolo

(b. July 16, 1486, Florence — d. Sept. 28, 1530, Florence) Italian painter

active in Florence. After an apprenticeship with Piero di Cosimo, he became established as one of the outstanding painters of Florence, most notably as a fresco decorator and painter of altarpieces in the style of the High Renaissance. His feeling for colour and atmosphere was unrivaled among Florentine painters. One of his most striking achievements was the series of grisaille frescoes on the life of St. John the Baptist (1511-26) in the Chiostro dello Scalzo. His work is noted particularly for its technical perfection. See photograph above.

Andreanof \,an-dre-'a-n6f\ Islands Group of the Aleutian Islands, southwestern Alaska, U.S. Lying between the Pacific Ocean and the Bering Sea, the islands extend east to west about 270 mi (430 km) between the Fox and Rat island groups. They were strategically important in World War II, when U.S. military bases were developed, especially on Adak Island. Other islands in the group include Atka, Tanaga, and Kanaga.

Andreini \,an-dra-'e-ne\ family Italian actors. After their marriage, Francesco Andreini (1548-1624) and Isabella Canali Andreini (1562—1604) founded the Compagnia dei Gelosi, one of the earliest and most famous of the commedia dell' arte troupes. Their son Giovambattista Andreini (15797-1654) acted in his parents' company until c. 1601, when he formed his own troupe, the Compagnia dei Fedeli. This troupe was invited to the French court in Paris, where Giovambattista Andreini wrote the play Adamo (1613), supposedly the inspiration for English poet John Milton's Paradise Lost.

Andretti, Mario (Gabriel) (b. Feb. 28, 1940, Montona, Italy) Italian-born U.S. automobile-racing driver. He became interested in racing in Italy before moving to the U.S. in 1955. His notable wins include the United States Automobile Club (US AC) championship (1965-66, 1969), the Daytona Beach 500 stock-car race (1967), the Sebring Grand Prix (1967, 1970), the Indianapolis 500 (1969), and the Formula I world driving championship (1978). He retired from competition in 1994.

Andrew, Saint (d. ad 60/70, Patras, Achaia; feast day November 30) One of the Twelve Apostles, brother of St. Peter, and patron saint of Scotland and Russia. According to the Gospels, he was a fisherman and a disciple of John the Baptist. Early Byzantine tradition calls Andrew protokletos, "first called." He and Peter were called from their fishing by Jesus, who promised to make them fishers of men. Early church legends tell of Andrew's missionary work around the Black Sea. A 4th-century tradition says he was crucified; 13th-century tradition states that the cross was X-shaped. His relics were moved several times after his death; his

head was kept in St. Peter’s in Rome from the 15th century until 1964, when the pope returned it to Greece as a gesture of goodwill.

Andrew II Hungarian Endre (b. 1175 — d. Oct. 26, 1235) King of Hungary (1205-35). His reign was marked by controversy with the landed nobility, who drained royal funds and reduced Hungary to a state of near anarchy. Rebellious nobles murdered his first wife, Gertrude of Meran, in 1213. Andrew led a Crusade to the Holy Land in 1217. On his return he agreed to the Golden Bull of 1222, limiting royal rights, guaranteeing justice, promising improved coinage, and giving nobles the right to resist royal decrees. His daughter was St. Elizabeth of Hungary.

Andrews, Dame Julie orig. Julia Elizabeth Wells (b. Oct. 1, 1935, Walton-on-Thames, Surrey, Eng.) British-U.S. actress and singer. She made her London debut at 12 in a revue and her New York City stage debut in The Boy Friend (1954). A major star of the Broadway musical, she originated the roles of Eliza Doolittle in My Fair Lady (1956) and Guinevere in Camelot (1960). She also starred in films such as Mary Poppins (1964, Academy Award), and Victor/Victoria (1982), one of several films she made with her husband, director Blake Edwards. In 2000 she was made a Dame of the British Empire.

Andrews, Roy Chapman (b. Jan. 26, 1884, Beloit, Wis., U.S. — d. March 11, 1960, Carmel, Calif.) U.S. naturalist, explorer, and author. In 1906 he joined the staff of the American Museum of Natural History, where he would spend much of his working life. There he assembled one of the best collections of cetaceans in the world before turning his attention to Asiatic exploration. He led expeditions to Tibet, southwestern China, and Burma (1916—17); northern China and Outer Mongolia (1919); and Central Asia. Important discoveries included the first known dinosaur eggs, skeleton parts of Baluchitherium (the largest known land mammal), and evidence of prehistoric human life. His many books for the general public include Across Mongolian Plains (1921) and This Amazing Planet (1940).

Andric \'an-drich\, Ivo (b. Oct. 10, 1892, Dolac, near Travnik, Bosnia — d. March 13, 1975, Belgrade, Yugos.) Bosnian writer. He established his reputation with Ex Ponto (1918), which he wrote while interned for nationalist political activities in World War I. He later served as a Yugoslavian diplomat. Collections of his short stories were published from 1920 onward. Of his three novels, written during World War II,

Marriage of St. Catherine, oil on panel by Andrea del Sarto, 1512-13; in the Gemaldegalerie Alte Meister, Dresden, Ger.

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two — The Bridge on the Drina (1945) and Bosnian Story (1945) — are about the history of Bosnia. He was awarded the Nobel Prize for Literature in 1961.

androgen Van-dro-joM Any of a group of hormones that mainly influence the development of the male reproductive system. The main and most active androgen is testosterone, produced by cells in the testes. Androgens produced in smaller quantities, mainly by the adrenal gland but also by the testes, support the functions of testosterone. Androgens cause the normal changes of puberty in boys' bodies and then influence sperm-cell formation, sexual interest and behaviour, and male pattern baldness. Females produce trace quantities of androgens, mostly in the adrenal glands, as well as in the ovaries.

Andromeda \an-'dra-m3-do\ In Greek mythology, the wife of Perseus. She was the daughter of King Cepheus and Queen Cassiope of Joppa in Palestine (called Ethiopia). Her mother boasted that Andromeda was more beautiful than the Nereids, and Poseidon punished her by sending a sea monster to devastate Joppa. To appease the gods, Andromeda was chained to a rock and left to be devoured by the monster. Perseus flew by on Pegasus, fell in love with Andromeda, and slew the monster. She married him and bore him six sons and a daughter. After her death she became a constellation.

Andromeda \an-'dro-m3-d3\ Galaxy or M31 Great spiral galaxy in the constellation Andromeda. It is the nearest spiral galaxy outside the Milky Way Galaxy and one of the few visible to the unaided eye, appearing as a milky blur. About 2 million light-years from Earth, it has a diameter of about 200,000 light-years, which makes it the largest galaxy in the Local Group. For centuries astronomers considered it part of the Milky Way; only in the 1920s did Edwin Hubble determine conclusively that it was a separate galaxy.

Andronicus I Comnenus \ I an-dr3-'nI-k3s...kam- , ne-n3s\ (b. 1118, Constantinople — d. Sept. 1185, Constantinople) Byzantine emperor (1183-85), the last of the Comnenus dynasty. A cousin of Manuel I Comnenus, he raised an army and seized power in 1182, causing a massacre of Westerners in Constantinople. He was crowned coemperor with Alexius II in 1183; two months later he had Alexius strangled and married his 13-year-old widow. Andronicus reformed the Byzantine government and asserted the independence of the Eastern church, provoking a Sicilian Norman invasion. News of the Normans' approach led to a revolt, in which Andronicus was killed by a mob and Isaac II Angelus was declared emperor.

Andronicus II Palaeologus \,pa-le-'al-3-g3s\ (b. c. 1260, Constantinople — d. Feb. 13, 1332, Constantinople) Byzantine emperor (1282-1328). The son of Michael VIII Palaeologus, he was an intellectual and theologian rather than a soldier and statesman, and during his reign the Byzantine Empire declined to the status of a minor state. Ottoman Turks controlled Anatolia by 1300, and Serbs dominated the Balkans. By siding with Genoa in the war between Genoa and Venice, Andronicus provoked an attack by the Venetian navy. Despite the rising political disorder, he promoted Byzantine art and the independence of the Eastern Orthodox church. Deposed by his grandson Andronicus III Palaeologus, he entered a monastery.

Andronicus III Palaeologus (b. March 25, 1297, Constantinople — d. June 15, 1341, Constantinople) Byzantine emperor (1328-41). He forced his grandfather Andronicus II Palaeologus to make him coemperor (1325) and then to abdicate (1328). He relied on John VI Cantacuzenus to reform the courts and rebuild the imperial navy. He ceded control of Macedonia to Serbia (1334) and lost land to the Ottoman Turks in Anatolia, but he regained some Aegean islands from the Genoese and reasserted control of Epirus and Thessaly.

Andropov Van-'dro-.pofV Yury (Vladimirovich) (b. June 15, 1914, Nagutskoye, Russia — d. Feb 9, 1984, Moscow, Russia, U.S.S.R.) Soviet leader. He joined the Communist Party in 1939 and rose rapidly in the party hierarchy. His tenure as head of the KGB (1967-82) was noted for its suppression of political dissidents. In 1982 he succeeded Leonid Brezhnev as general secretary of the party's Central Committee, but ill health quickly overtook him, and he accomplished little else before his death 15 months later.

Andros \,an-dr3s\ Island (pop., 2000: 7,686), The Bahamas. The Bahamas' largest island, it extends about 100 mi (160 km) north to south and about 45 mi (72 km) east to west; its area is 2,300 sq mi (6,000 sq km). Just off its eastern coast is the third largest barrier reef in the world.

Andros Yan-drasX, Sir Edmund (b. Dec. 6, 1637, London, Eng. — d. Feb. 24, 1714, London) English colonial administrator in North America. Appointed governor of New York and New Jersey in 1674, he was recalled in 1681 following complaints from colonists. He returned in 1686 as governor of the Dominion of New England, a kind of supercolony imposed by Britain. His interference in local government aroused sharp resentment among the colonists, and in 1688 they revolted and imprisoned him. Andros was recalled to England but returned as governor of Virginia (1692) and Maryland (1693-94).

anemia Condition in which erythrocytes are reduced in number or volume or are deficient in hemoglobin. The patient is usually noticeably pale. Close to 100 varieties exist (including aplastic anemia, pernicious anemia, and sickle-cell anemia), distinguished by cause; erythrocyte size, shape, and hemoglobin content; and symptoms. Anemia may result from blood loss; increased destruction, reduced production, or inhibited formation of red cells; or hormone deficiency. Treatment may involve nutrition, toxin removal, drugs, surgery, or transfusion. See also folic-acid-deficiency anemia, IRON-DEFICIENCY ANEMIA.

anemometer Yan-s-'ma-ms-tsiA Instrument for measuring the speed of airflow. The most familiar instruments for measuring wind speeds are the revolving cups that drive an electric generator (useful range approximately 5-100 knots). For very low airspeeds, a unit in which revolving vanes operate a counter measures the airspeed. For strong, steady wind speeds (in wind tunnels and aboard aircraft in flight), a pitot-tube anemometer is often used; the pressure difference between the interior of the tube and the surrounding air can be measured and converted to airspeed.

anemone \3-'ne-m3-ne\ Any of about 120 species of perennial plants that make up the genus Anemone , in the buttercup family, many of which are cultivated for their colourful flowers. Though found throughout the world, anemones are most common in woodlands and meadows of the

northern temperate zone. Many varieties of the tuberous poppylike anemone A. coronaria are grown for the garden and florist trade. Popular spring-flowering species include A. apennina, A. blanda, and A. pavonina. Other species, such as the Japanese anemone (A. hupehensis), are favourite border plants for autumn flowering. The European wood anemone, A. nemorosa, causes blistering of the skin and was once used as an ingredient in medicines. Anemones are also known colloquially as pasqueflowers or windflowers.

anesthesiology Ya-nss-.the-ze-'al-s-jeN Medical specialty dealing with anesthesia and related matters, including resuscitation and pain. Originally concerned only with general anesthesia in the operating room, anesthesiology now includes epidural anesthesia (injection of local anesthetics into the spinal fluid, cutting off feeling below the point of injection); artificial respiratory support during operations requiring paralyzing drugs that render patients unable to breathe; clinical management of all unconscious patients; management of pain relief and cardiac and respiratory resuscitation problems; respiratory therapy; and treatment of fluid, electrolyte, and metabolic disturbances. Progress in anesthesiology has made possible more complex operations and surgery for more critically ill patients. The anesthesiologist’s role has become increasingly important and complex.

anesthetic \,an-es-'thet-ik\ Agent that produces a local or general loss of sensation, including pain, and therefore is useful in surgery and dentistry. General anesthesia induces loss of consciousness, most often using hydrocarbons (e.g., cyclopropane, ethylene); halogenated (see halogen) hydrocarbons (e.g., chloroform, ethyl chloride, trichloroethylene); ethers (e.g., ethyl ether or vinyl ether); or other compounds, such as tribromoethanol, nitrous oxide, or barbiturates. Local anesthesia induces loss of sensation in one area of the body by blocking nerve conduction (see nervous system, neuron), usually with alkaloids such as cocaine or synthetic substitutes (e.g., lidocaine). See also anesthesiology.

aneuploidy See ploidy

aneurysm Van-ya-.riz-smV Blood-filled protrusion in the wall of a blood vessel (usually an artery, and particularly the aorta). Disease or injury weakens the wall so that normal blood pressure makes it balloon out. Typically, the two inner layers rupture and the outer layer bulges. In a false aneurysm, all three layers rupture and surrounding tissues hold the blood in place. Symptoms vary with size and location. Aneurysms tend to enlarge over time, and blood-vessel walls weaken with age. Many aneurysms eventually burst, causing serious, even massive, internal bleed-

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ing; aortic aneurysm rupture causes severe pain and immediate collapse. Rupture of an aneurysm in the brain is a major cause of strokes. Treatment can consist of simply tying off a small vessel; more serious aneu-

rysms require surgery to replace the diseased section of artery with a plastic graft.

Angara \3n-,g3-'ra\ River River, southeast-central Russia. The outlet for Lake Baikal, it is a major tributary of the Yenisey River, which it joins near Yeniseysk. It is about 1,105 mi (1,779 km) long, and with its many rapids, it provides great potential for hydroelectric power. Some existing dams and power stations provide power in the Irkutsk industrial area.

angel Primarily in Western religions, any of numerous benevolent spiritual beings who mediate between heaven and earth. They often serve as messengers or servants of God or as guardians of an individual or nation. In Zoroastrianism the amesha spenta are arranged in a hierarchy of seven. Judaism and Christianity base their notion of angels on references in the Hebrew scriptures to divine servants and to the heavenly hosts. Two archangels (Michael and Gabriel) are mentioned in the Old Testament and two others (Raphael and Uriel) in the Apocrypha. Angels are mentioned throughout the Christian scriptures, and Christian tradition identifies nine orders of angels. Islam’s hierarchy of angels descends from the four throne bearers of God to the cherubim who praise God, the four archangels, and lesser angels such as the hafazah (guardian angels). See also cherub; seraph.

Angel Falls Waterfall, southeastern Venezuela. It lies on the Churun River, a tributary of the Carom, southeast of Ciudad Bolivar. The highest waterfall in the world, the cataract drops 3,212 ft (979 m) and is 500 ft (150 m) wide at its base. It was named for James Angel, an American who crash-landed his plane nearby in 1937.

angelfish Any of various fishes of the order Perciformes. The best-known angelfishes are freshwater ClCHLlDs (genus Pterophyllum) popular in home aquariums. These are thin and deep-bodied fishes that usually are silver with vertical dark markings but may be solid or partially black; they may grow to 6 in.

(15 cm) in length. Brightly coloured marine angelfishes are in the family Pomacanthidae. They are found among tropical reefs in the Atlantic and the Indo-Pacific, where they eat algae and marine invertebrates and reach a maximum length of 18 in.

(46 cm).

Angelico Van-'jel-i-koV Fra orig.

Guido di Pietro (b. c. 1400, Vicchio, Florence [Italy] — d. Feb. 18,

1455, Rome) Italian painter and Dominican friar active in Florence.

He entered the convent of San Domenico at Fiesole sometime between 1417 and 1425 and began his artistic career by painting illuminated manuscripts and altarpieces.

He was influenced by Masaccio’s use of architectural perspective.

Among his earliest masterpieces is a large triptych, the Linaiuoli Altarpiece (1433-36), executed for the linen merchants’ guild; it is enclosed in a marble shrine designed by Lorenzo Ghiberti. His most notable works are frescoes at the convent of San Marco, Florence (c. 1440-45), and in the chapel of Pope Nicholas V in the Vatican (c. 1448-49). One of the outstanding fresco painters of the 15th century, he influenced such masters as Fra Filippo Lippi; Benozzo Gozzou was among his students.

Angelou \'an-j3-,lo\, Maya orig. Marguerite Johnson (b. April 4, 1928, St. Louis, Mo., U.S.) U.S. poet. She was raped at age eight and went through a period of muteness. Her autobiographical works, which explore themes of economic, racial, and sexual oppression, include I Know Why the Caged Bird Sings (1970), The Heart of a Woman (1981), and All God’s Children Need Traveling Shoes (1986). Her poetry collections include Just Give Me a Cool Drink of Water fore I Diiie (1971), And Still I Rise (1978), and I Shall Not Be Moved (1990). Her recitation of a poem she wrote for Bill Clinton’s first inauguration (1993) brought her widespread fame. In 2002 she published her sixth volume of memoirs, A Song Flung Up to Heaven.

Angevin \'an-ja-v3n\ dynasty Descendants of a 10th-century count of Anjou (the source of the adjective Angevin). The Angevin dynasty overlaps with the house of Plantagenet but is usually said to consist of only the English kings Henry II, Richard I, and John. Henry established the Angevin empire in the 1150s when he took control of Normandy, Anjou, Maine, and, through his marriage to Eleanor, Aquitaine. When he became the king of England in 1154, Henry extended the Angevin holdings from Scotland to the Pyrenees. English claims to French territory led to the Hundred Years' War; by 1558 the English had lost all their former French lands.

Angilbert Yaq-gal-.bortV, Saint (b. c. 740, Aachen, kingdom of the Franks — d. Feb. 18, 814, Centula, Picardy) Frankish poet and prelate at the court of Charlemagne. Of a noble family, he was educated at the palace school at Aachen and was a student of Alcuin. In 800 he accompanied Charlemagne to Rome. He was made lay abbot of Centula (St.-Riquier), Picardy, in 794. His graceful and sophisticated Latin poems offer a picture of life in the imperial circle. Charlemagne’s daughter Bertha and Angilbert were the parents of the historian Nithard.

angina pectoris Van-'jl-ns-'pek-ts-rssV Spasm of chest pain, caused when the heart’s oxygen demand temporarily outpaces its blood supply, usually because of coronary heart disease. A deep, viselike pain in the heart and stomach area commonly spreads to the left arm. Exertion or emo-

tional stress can bring on angina, obliging the victim to rest until the pain subsides. If rest does not help, drugs can dilate the blood vessels. As heart disease worsens, angina recurs with less exertion.

angiocardiography \ 1 an-je-o- 1 kar-de- , ag-r9-fe\ Method of diagnostic imaging that shows the flow of blood through the heart and great vessels. It is used to evaluate patients for surgery on the cardiovascular system. A contrast medium is introduced through a catheter into a heart chamber. A series of X-ray images shows where the flow narrows, signaling blockage of a blood vessel by atherosclerosis.

angiography \,an-je-'ag-r3-fe\ or arteriography \ar-,tir-e-'ag-r3-fe\ X-ray examination of arteries and veins with a contrast medium to differentiate them from surrounding organs. The contrast medium is introduced through a catheter to show the blood vessels and the structures they supply, including organs. Angiography of diseased leg, brain, or heart arteries is necessary before corrective surgery. See also angiocardiography.

Angiolini \.an-j3-'le-ne\, Gasparo or Angelo Gasparini (b. Feb. 9, 1731, Florence — d. Feb. 6, 1803, Milan) Italian choreographer. In 1757 he became ballet master of the Vienna court opera house; in 1761 he collaborated with the composer Christoph Willibald Gluck to produce Don Juan, and he later choreographed other ballets to Gluck’s music. In 1765 Angiolini became ballet master of the Imperial Theatre in St. Petersburg. He was among the first to integrate dance, music, and plot in dramatic ballets, developing the form known as ballet d’ action. He maintained a rivalry with Jean-Georges Noverre and disagreed with his interpretation of the ballet d’ action.

angioplasty Van-je-s-.plas-teX Therapeutic opening of a blocked blood vessel. Usually a balloon is inflated near the end of a catheter (see catheterization) to flatten plaques (see atherosclerosis) against an artery’s wall. Performed on a coronary artery, angioplasty is a less invasive alternative to coronary bypass surgery in the treatment of coronary heart disease. Complications, including embolisms and tearing, are rare and results are excellent, but plaques tend to build up again after the procedure. Angioplasty is also used to expand a severely obstructed heart valve.

angiosperm See flowering plant

Angkor Archaeological site, northwestern Cambodia. Located 4 mi (6 km) north of the modem town of Siem Reap, it was the capital of the Khmer (Cambodian) empire from the 9th to the 15th century. Its most imposing monuments are Angkor Wat, a temple complex built in the 12th century by King Suryavarman II, and Angkor Thom, a temple complex

Angel Falls (Salto Angel), La Gran Sabana region of Bolivar state, Venezuela.

G. DE STEINHEIL/SHOSTAL ASSOCIATES

An aquarium angelfish (Pterophyllum)

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built c. 1200 by King Jayavarman VII. During the period of great construction that lasted more than 300 years, there were many changes in architecture as the religious focus changed from Hindu to Buddhist cults. After the Siamese conquest of the Khmer in the 15th century, the ruined city and its temples were buried in the jungle. When the French colonial regime was established in 1863, the entire site became the focus of scholarly interest. During Cambodia's political upheavals of the late 20th century there was some war damage, but the major problem was one of neglect. Angkor was added to the World Heritage site list in 1992.

Angkor Wat Vaq-kor-'watX Temple complex in Angkor (now in northwestern Cambodia), the crowning work of Khmer architecture. About 1,700 yards (1,550 m) long by 1,500 yards (1,400 m) wide, it is the world's largest religious structure. Dedicated to Vishnu, it was built in the 12th century by Suryavarman II. The Wat, an artificial mountain originally surrounded by a vast external wall and moat, rises in three enclosures toward a flat summit. The five remaining towers (shrines) at the summit are composed of the repetitive diminishing tiers typical of Asian architecture.

Angle Any member of a Germanic people who, with the Jutes and Saxons, invaded England in the 5th century ad. According to Bede, their homeland was Angulus, traditionally identified as the Angeln district in Schleswig. They abandoned this area when they invaded Britain, where they settled in the kingdoms of Mercia, Northumbria, East Anglia, and Middle Anglia. Their language was known, even then, as Englisc, and they gave their name to England.

angle In geometry, a pair of rays (see line) sharing a common endpoint (the vertex). An angle may be thought of as the rotation of a single ray from an initial to a terminal position. Clockwise rotation is considered negative and counterclockwise rotation positive. Either may be measured in degrees (one full rotation = 360°) or radians (one full rotation = 2n rad). A 90° angle is called a right angle. Any angle less than 90° is an acute angle. Any angle more than 90° but less than 1 80° is an obtuse angle.

anglerfish Any of about 210 species of marine fishes (order Lophiiformes) named for their method of "fishing" for prey. The foremost spine of the dorsal fin is located on the head and is modified into a "fishing rod" tipped with a fleshy "bait." Prey fishes attracted to this lure stray close enough for the anglerfish to swallow them. Often bizarre in form, anglerfishes are also characterized by small gill openings and by limblike pectoral and (in some species) pelvic fins. Most species inhabit the sea bottom. In some species the small male bites into the larger female's body, his mouth fuses with the skin, and the bloodstreams of the two become permanently connected.

Anglesey Vaq-gsl-seV Isle of ancient Mona County (pop., 2001: 66,828), Wales. It encompasses Anglesey island, the largest island in England and Wales (276 sq mi [715 sq kmj), and Holy Island. Anglesey island is known for its ancient history and its prehistoric and Celtic remains. By 100 bc the Celts had colonized the island, which became a famous Druid centre and later a stronghold of resistance to the Romans. It finally fell to Agricola in ad 78. It was ruled by the princes of Wales in the 7th- 13th centuries, until it was taken by Edward I. Tourism is now an important part of the county's economy.

Anglia See England

Anglican Communion See Church of England

Anglo-Afghan Wars See Afghan wars

Anglo-Burmese Wars (1824-26, 1852, 1885) Conflicts between the British and the Burmans (Burmese) in present-day Myanmar. King Bodawpaya's conquest of Arakan, which bordered on British-controlled territory in India, led to border conflicts between Arakan freedom fighters and the Burmans. When the Burmans crossed the border into Bengal, the British responded in force, taking Rangoon (now Yangon). The resulting two-year conflict ended with a treaty that gave Britain Arakan and Assam and required the Burmans to pay an indemnity. Another war erupted 25 years later when a British naval officer seized a ship that belonged to the Burman king; the British advanced into and soon occupied all of Lower Burma. A third war was sparked by threats to the British teak monopolies in Lower Burma and Burman overtures to the French; as a result, the British annexed Upper Burma (formalized in 1886), thus ending Burman independence.

Anglo- Dutch Wars or Dutch Wars Four naval conflicts between England and the Dutch Republic in the 17th— 1 8th century. The First

(1652-54), Second (1665-67), and Third (1672-74) Anglo-Dutch Wars all arose from commercial rivalry between the two nations, and victories by England established its naval might. The two countries had been allied for a century when the Fourth Anglo-Dutch War (1780-84) broke out over Dutch interference in the American Revolution. By 1784 the Dutch Republic had declined dramatically in power and prestige.

Anglo-French Entente See Entente Cordiale
Anglo-French War See Opium Wars

Anglo-German Naval Agreement (1935) Bilateral concord between Britain and Germany countenancing a German navy but limiting it to 35% of the size of the British navy. Part of the process of appeasement before World War II, the agreement allowed Germany to violate restrictions imposed by the Treaty of Versailles, prompting international criticism and driving a wedge between the French and the British.

Anglo-Japanese Alliance (1902-23) Alliance between Britain and Japan to protect their respective interests in China and Korea. Directed against Russian expansionism, the alliance helped Japan in the Russo-Japanese War by discouraging France from entering the war on the Russian side. The alliance later prompted Japan to enter World War I on the

side of the Allies. Britain allowed the alliance to lapse after the war, when it no longer feared Russian encroachment in China.

Anglo-Russian Entente \an-'tant\ (1907) Pact in which Britain and Russia settled their colonial disputes in Persia, Afghanistan, and Tibet. It delineated spheres of influence in Persia, stipulated that neither country would interfere in Tibet’s internal affairs, and recognized Britain’s influence over Afghanistan. The agreement led to the formation of the Triple Entente.

Anglo-Saxon See Old English

Anglo-Saxon art Painting, sculpture, and architecture produced in Britain from the late 5th century to the Norman Conquest. Before the 9th century, manuscript illumination was the predominant art form, with two schools: Canterbury produced works in the Classical tradition brought by Roman missionaries; a more influential school in Northumbria produced works inspired by the revival of learning encouraged by Irish missionaries. The curvilinear forms, spirals, and interlaced patterns of the Celtic tradition brought by Irish monks were integrated with the abstract ornamentation and bright colors of the Anglo-Saxon metalwork tradition. After the destructive effects of the 9th-century Danish invasions, the monasteries were revived and interest in architecture developed. Building activity consisted of small churches influenced by continental types, notably from Norman France (e.g., the original Westminster Abbey, c. 1045-50, rebuilt 1245). The monastic revival resulted in the production of many books and the formation of the Winchester school of illumination (late 10th century). See also Hiberno-Saxon style.

Anglo-Saxon law Body of legal principles that prevailed in England from the 6th century until the Norman Conquest (1066). It was directly influenced by early Scandinavian law as a result of the Viking invasions of the 8th and 9th centuries and indirectly influenced (primarily through the church) by Roman law. Anglo-Saxon law had three components: laws promulgated by the king, customary practices such as those regulating kinship relations, and private compilations. The primary emphasis was on criminal law, though certain material dealt with problems of public administration, public order, and ecclesiastical matters.

Anglo-Saxon literature Literature written in Old English c. 650-c. 1100. Anglo-Saxon poetry survives almost entirely in four manuscripts. Beowulf is the oldest surviving Germanic epic and the longest Old English poem; other great works include The Wanderer, The Seafarer, The Battle of Maldon, and the Dream of the Rood. The poetry is alliterative; one of its features is the kenning, a metaphorical phrase used in place of a common noun (e.g., “swan road” for “sea”). Notable prose includes the Anglo-Saxon Chronicle, a historical record begun about the time of King Alfred’ s reign (871-899) and continuing for more than three centuries. See also Caedmon; Cynewulf.

Angola officially Republic of Angola formerly Portuguese West Africa Country, southern Africa. Its northernmost section of coastland, the Cabinda exclave, is separated from Angola proper by a narrow corridor of Congo territory. Area: 481,354 sq mi (1,246,700 sq km). Population (2005 est.): 11,827,000. Capital: Luanda. The population is made up of mostly BANTU-speaking peoples; the main ethnic groups are

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Religions: Christianity (mostly Roman Catholic; also Protestant); also traditional beliefs. Currency: kwanza. The country contains several plateau regions, which separate it into three distinct drainage systems. One in the northeast drains into the Congo River basin, and another in the southeastern sector drains into the Zambezi system; the remaining drainage, westward into the Atlantic, provides most of Angola's hydroelectric power. About half of the land area is forest; less than 10% is arable. Despite substantial petroleum reserves, Angola's economy has been unable to take advantage of its resources, because of the devastation caused by protracted civil war. Angola is nominally a republic with one legislative house; its head of state and government is the president. An influx of Bantu- speaking peoples in the 1st millennium ad led to their dominance in the area by c. 1500. The most important Bantu kingdom was the Kongo; south of the Kongo was the Ndongo kingdom of the Mbundu people. Portuguese explorers arrived in the early 1480s and over time gradually extended their rule. Angola's frontiers were largely determined by other European powers in the 19th century but not without strong resistance by the indigenous peoples. Resistance to colonial rule led to the outbreak of fighting in 1961, which led ultimately to independence in 1975. Rival factions continued fighting after independence. Although a peace accord was reached in 1994, forces led by Jonas M. Savimbi continued to resist government control until his death in 2002, after which a peace accord was signed.

Angora See Ankara

Angora cat See Turkish Angora cat

Angora goat Breed of domestic goat that originated in ancient times in the district of Angora in Asia Minor. Its silky coat yields commercial mohair. Angora goats are generally smaller than other domestic goats and sheep and have long, drooping ears. Both sexes are homed. The Western mohair industry developed after the animal was established in South Africa in the mid- 19th century. Importation to the U.S. followed shortly, and breeding there has centred in the Southwest.

The coat, with its strong elastic fibres, differs from wool primarily in its smoothness and lustre.

Angouleme \,a n -gu-'lam\ City (pop., 1999: 43,171), southwestern

France, on the Charente River. Clovis captured the town from the Visigoths in 507, and from the 9th century it was the centre of a countship. Fought over by the French and English in the Hundred Years' War, it was ceded to England in 1360 but restored to France in 1373. It passed to the house of Orleans in 1394. The city is noted for papermaking and is the site of the 12th-century cathedral of Saint-Pierre.

Angry Young Men Group of mid-20th-century young British writers. Their works express the bitterness of the lower classes toward the established sociopolitical system and the mediocrity and hypocrisy of the middle and upper classes. The label came from a press agent’s description of John Osborne, whose play Look Back in Anger (1956) is the movement’s representative work. The group includes John Wain (1925-1994), Kingsley Amis, Alan Sillitoe, and Bernard Kops (b. 1926). A dominant literary force in the 1950s, the movement had faded by the early 1960s.

Angstrom Vaq-strcemX, Anders Jonas (b. Aug. 13, 1814, Logdo, Swed. — d. June 21, 1874, Uppsala) Swedish physicist. From 1839 he taught at the University of Uppsala. He devised a method of measuring thermal conductivity, showing it to be proportional to electrical conductivity, and deduced that an incandescent gas emits rays of the same refrangibility as those it can absorb. A founder of spectroscopy, he discovered that hydrogen is present in the Sun’s atmosphere, published a map of the normal solar spectrum, and was the first to examine the spectrum of the aurora borealis and to detect and measure the characteristic bright line in its yellow-green region. The angstrom (1CT 10 m), a unit of length, was named in his honour.

Anguilla \aq-'gwi-b\ Island (pop., 2001: 11,300), Leeward Islands, West Indies. A dependent territory of the United Kingdom, it is the most northerly of the Leeward Islands and covers about 35 sq mi (90 sq km). Its territory includes nearby Scrub, Seal, Dog, and Sombrero islands and Prickly Pear Cays. Most of its people are descendants of African slaves. The official language is English, and most of the population is Protestant. First colonized in 1650 by settlers from Saint Kitts, it was administered by the British. From 1825 it was closely associated with Saint Kitts, a situation Anguilla protested. It was united with Saint Kitts and Nevis in 1882. When a nation consisting of the three was formed in 1967, Anguilla proclaimed its independence. The British intervened, and Anguilla was separated in 1980; while retaining some autonomy, it consented to remain under British rule.

angular momentum Property that describes the rotary inertia of a system in motion about an axis. It is a VECTOR quantity, having both magnitude and direction. The magnitude of the angular momentum of an object is the product of its linear momentum (mass m x velocity v) and the perpendicular distance r from the centre of rotation, or mvr. The direction is that of the axis of rotation. The angular momentum of an isolated system is constant. This means that a rigid spinning object continues to spin at a constant rate unless acted upon by an external torque. A spinning GYROSCOPE in an airplane remains fixed in its orientation, independent of the airplane’s motion, because of the conservation of direction as well as magnitude.

Angus Breed of black, hornless beef cattle. Formerly known as Aberdeen Angus, it originated in northeastern Scotland, but its ancestry is obscure. Angus have a compact and low-set body. The fine quality of the flesh and the high dressing percentage make it a beef breed of the high-

est rank. Introduced into the U.S. in 1873, its influence there and in other countries spread widely thereafter.

Anhalt Van-,halt\ Former German state in what is now central Germany. The area around the upper Elbe River from which Anhalt was constituted was, in the 11th century, still part of the duchy of Saxony. It achieved separate territorial status in 1212. Subdivided and reunited frequently, it was finally reconstituted as the duchy of Anhalt by Leopold IV in 1863. It became part of the German Empire in 1871. Reconstituted after World War II as Saxony-Anhalt, it subsequently became part of East Germany and, in 1990, part of reunified Germany.

Anheuser Van-hoi-zorX -Busch Co., Inc. One of the largest producers of beer in the world. Headquarters are in St. Louis, Mo., U.S. Its origins can be traced to a small brewery founded in 1852 and bought in 1860 by soap manufacturer Eberhard Anheuser. In 1861 his daughter married

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Adolphus Busch, a brewery supplier. Busch pioneered the use of refrigerated railcars and of pasteurization in the brewing industry. In 1876 the company introduced a light-coloured beer called Budweiser; under August Anheuser Busch, Jr. (president 1946-75), and August A. Busch III (1975—2002), it became the best-selling U.S. beer brand. The company also produces the Michelob brand. Among its other holdings are beverage-container manufacturing and recycling plants, media and advertising groups, and amusement parks, including the SeaWorld theme parks and Busch Gardens (Tampa, Fla.).

anhinga or snakebird Any fish-eating bird of the family Anhingidae (order Pelecaniformes), sometimes considered a single species (Anhinga anhinga) with geographical variants. Anhingas are about 35 in. (90 cm) long, slender, and long-necked. They are mostly black, with silvery wing markings. Males, glossed with green, develop pale head plumes and a dark “mane” in breeding season. Anhingas live in small colonies along lakes and rivers in tropical to warm temperate regions except in Europe. They swim nearly submerged; the head and neck show above water, darting snakelike from side to side.

Anhui or An-hui conventional Anhwei \'an-'hwa\ Province (pop., 2002 est.: 63,380,000), east-central China. It is bounded by Jiangsu, Zhejiang, Jiangxi, Hubei, Shandong, and Henan provinces. With an area of 54,000 sq mi (139,900 sq km), it is one of China’s smallest provinces; its capital is Hefei. Anhui was the first part of southern China to be settled by the Han dynasty, from c. 205 bc. Well-watered by the Huai and Yangtze (Chang) rivers, it was the empire’s major agricultural area for several centuries. Anhui was ruled by the Ming dynasty in the 14th- 17th centuries. It was occupied by the Japanese in World War II; after the war the

Nationalists held it briefly before the communists took over. It remains a notable agricultural producer.

anhydride \ l an- , hl-,drld\ Any chemical compound obtained, either in practice or in principle, by eliminating water (H 2 0) from another compound. Examples of inorganic anhydrides are sulfur trioxide, S0 3 , which is derived from sulfuric acid, H 2 S0 4 , and calcium oxide, CaO, which is derived from calcium hydroxide Ca(OH) 2 . The most important organic anhydride is acetic anhydride, (CH 3 C0) 2 0, a raw material for making cellulose acetate (used for films, fibres, and plastic goods) and aspirin. It can be thought of as acetic acid minus water. Organic anhydrides are very important starting materials for organic synthesis, as they can give rise to carboxylic acids, esters, or amides under the proper conditions.

anhydrite Rock-forming mineral, anhydrous calcium sulfate (CaS0 4), which differs chemically from gypsum (to which it changes in humid conditions) by having no water of crystallization. Anhydrite occurs most often with salt deposits in association with gypsum, as in the cap rock of the Texas-Louisiana salt domes. Anhydrite is one of the major minerals in evaporite deposits; it is also present in dolomites and limestones, and in ore veins. It is used in plasters and cement as a drying agent.

Aniakchak \,an-e-'ak-chak\ National Monument and Preserve Park, southern shore of the Alaska Peninsula, U.S. Situated in the volcanically active Aleutian Range, it consists primarily of a great dry caldera, which last erupted in 1931. The crater has an average diameter of 6 mi (10 km). Declared a national monument in 1978, it covers 942 sq mi (2,440 sq km).

Aniene River \an-'ya-na\ River, central Italy. It rises in the Simbruini Mountains southeast of Rome and meanders 67 mi (108 km) to join the Tiber River north of Rome. Nero created a group of artificial lakes in its upper course and built a villa there, the remains of which survive.

aniline Va-no-.lInN One of the most important organic bases, parent substance for many dyes and drugs. Pure aniline is a highly poisonous, oily, colourless liquid with a distinctive odour. First obtained (1826) from indigo, it is now prepared synthetically. It is a weakly basic primary aromatic amine and participates in many reactions with other compounds. It is used to make chemicals used in producing rubber, dyes and intermediates, photographic chemicals, urethane foams, pharmaceuticals, explosives, herbicides, and fungicides as well as to make chemicals used in petroleum refining.

animal Any member of the kingdom Animalia (see taxonomy), a group of many-celled organisms that differ from members of the two other many-celled kingdoms, the plants and the fungi (see fungus), in several ways. Animals have developed muscles, making them capable of spontaneous movement (see locomotion), more elaborate sensory and nervous

systems, and greater levels of general complexity. Unlike plants, animals cannot manufacture their own food, and thus are adapted for securing and digesting food. In animals, the cell wall is either absent or composed of material different from that of the plant cell wall. Animals account for about three-quarters of living species. Some one-celled organisms display both plant and animal characteristics. See also algae, arthropod, bacteria, CHORDATE, INVERTEBRATE, PROTIST, PROTOZOAN, VERTEBRATE.

animal communication Transmission of information from one animal to another by means of sound, visible sign or behaviour, taste or odour, electrical impulse, touch, or a combination of these. Most animal communication uses sound (e.g., birds calling, crickets chirping). Visual communication usually indicates an animal's identity (species, sex, age, etc.) or other information through specific characteristics (e.g., horns, patches of colour) or behaviour (e.g., the bee's "dance" describing a source of food). Chemical communication involves pheromones (chemical signals) produced by the animal's endocrine system. Eels and some other fishes use electrical impulses to communicate.

animal husbandry Controlled cultivation, management, and production of domestic animals, including improvement of the qualities considered desirable by humans by means of breeding. Animals are bred and raised for utility (e.g., food, fur), sport, pleasure, and research. See also BEEKEEPING, DAIRY FARMING.

animal rights rights, primarily against being killed and being treated cruelly, that are thought to be possessed by higher nonhuman animals (e.g., chimpanzees) and many lower ones by virtue of their sentience. Respect for the welfare of animals is a precept of some ancient Eastern religions, including Jainism, which enjoins ahimsa ("noninjury") toward all living things, and Buddhism, which forbids the needless killing of animals, especially (in India) of cows. In the West, traditional Judaism and Christianity taught that animals were created by God for human use, including as food, and many Christian thinkers argued that humans had no moral duties of any kind to animals, even the duty not to treat them cruelly, because they lacked rationality or because they were not, like Man, made in the image of God. This view prevailed until the late 18th century, when ethical philosophers such as Jeremy Bentham applied the principles of utilitarianism to infer a moral duty not to inflict needless suffering on animals. In the latter half of the 20th century, the ethical philosopher Peter Singer and others attempted to show that a duty not to harm animals follows straightforwardly from simple and widely accepted moral principles, such as "It is wrong to cause unnecessary suffering." They also argued that there is no "morally relevant difference" between humans and animals that would justify raising animals, but not humans, for food on "factory farms" or using them in scientific experiments or for product testing (e.g., of cosmetics). An opposing view held that humans have no moral duties to animals because animals are incapable of entering into a hypothetical "moral contract" to respect the interests of other rational beings. The modern animal-rights movement was inspired in part by Singer's work. At the end of the 20th century, it had spawned a large number of groups dedicated to a variety of related causes, including protecting endangered species, protesting against painful or brutal methods of trapping and killing animals (e.g., for furs), preventing the use of animals in laboratory research, and promoting what adherents considered the health benefits and moral virtues of vegetarianism.

animals, cruelty to Willful or wanton infliction of pain, suffering, or death upon an animal or the intentional or malicious neglect of an animal. Perhaps the world's first anticruelty law, which addressed the treatment of domesticated animals, was included in the legal code of the Massachusetts Bay Colony (1641); similar legislation was passed in Britain in 1822. The world's first animal welfare society, the Society for the Protection of Animals, was established in England in 1824; the American Society for the Prevention of Cruelty to Animals was chartered in 1866.

In varying degrees, cruelty to animals is illegal in most countries, and interest in endangered species gave further impetus to the anticruelty movement in the late 20th century. Reflecting such interest, many laws have been passed, though they are seldom enforced unless public pressure is brought to bear. Acts targeted by the movement have ranged from the mistreatment of domesticated animals to bullfighting and vivisection. Factory farming, which involves various evidently cruel practices, has remained largely exempt from legal scrutiny. See also animal rights.

animals, master of the Supernatural figure regarded as the protector of game animals in the traditions of hunting peoples. In some tradi-

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tions he is the ruler of the forest and guardian of all species; in others, he is the guardian of a single species — usually a large and valuable animal — and may have both human and animal characteristics. He requires that hunters treat slain animals with respect; if they fail to do so, he may withhold game until he is placated through a ceremony or by a shaman.

animation Process of giving the illusion of movement to drawings, models, or inanimate objects. From the mid- 1850s, such optical devices as the zoetrope produced the illusion of animation. Stop-action photography enabled the production of cartoon films. The innovative design and assembly techniques of Walt Disney soon moved him to the forefront of the animation industry, and he produced a series of classic animated films, beginning with Snow White and the Seven Dwarfs (1937). The Fleischer brothers and the animators at Warner Brothers offered more irreverent cartoons that often appealed to adult audiences. In Europe new animation alternatives to line drawing were developed, including animation using puppets (sometimes made from clay). In the late 20th century computer animation, as seen in the first fully computer-generated animated feature, Toy Story (1995), moved the art to a new level.

anime Style of animation popular in Japanese films. Anime films are meant primarily for the Japanese market and, as such, employ many cultural references unique to Japan. For example, the large eyes of anime characters are commonly perceived in Japan as multifaceted “windows to the soul.” Much of the genre is aimed at the children’s market, but anime films are sometimes marked by adult themes and subject matter. Modern anime began in 1956 and found lasting success in 1961 with the establishment of Mushi Productions by Osamu Tezuka, a leading figure in modern manga (Japanese comics). Such anime as Akira (1988), Princess Mononoke (1997), and the Pokemon series of films have attained international popularity.

animism Belief in the existence of spirits separable from bodies. Such beliefs are traditionally identified with small-scale (“primitive”) societies, though they also occur in major world religions. They were first competently surveyed by Edward Burnett Tylor in Primitive Culture (1871). Clas-

sic animism, according to Tylor, consists of attributing conscious life to natural objects or phenomena, a practice that eventually gave rise to the notion of a soul. See also shaman.

anion \'a-,nl-9n\ Atom or group of atoms carrying a negative electric charge, indicated by a superscript minus sign after the chemical symbol. Anions in a liquid subjected to an electric field migrate toward the positive electrode (anode). Examples include hydroxyl (— OH - ; see hydroxide), carbonate (— C0 3 2-), and phosphate (— P0 4 3-). See also ion; compare

CATION.

anise Annual herb (Pimpinella anisum) of the parsley family, cultivated chiefly for its fruit, called aniseed, which tastes like licorice. Native to Egypt and the eastern Mediterranean region, anise is cultivated throughout the world. Aniseed is used as a flavouring and as a soothing herbal tea. Star anise is the dried fruit of the evergreen tree Illicium verum (magnolia family), native to southeastern China and Vietnam. Its flavour and uses are similar to those of anise.

Anjou \'an-jii\ Historical region, lower Loire valley, northwestern France. Organized in the Gallo-Roman period as the Civitas Andegavensis, it later became the countship, and from 1360 the duchy, of Anjou. Its capital was Angers. Under the Carolingian dynasty, it was nominally administered by a count representing the French king. The area came under the English king Henry II when he married Eleanor of Aquitaine in 1152, thus founding the Anglo-Angevin empire of the Plantagenet dynasty. The French recovered Anjou in 1259, and it was united with France in 1487. It ceased to exist as a department in 1790.

Anjou, House of See House of Plantagenet

Ankara Vaq-ko-r s\ formerly Angora City (pop., 1997: 2,984,099), capital of Turkey. Located about 125 mi (200 km) south of the Black Sea, it has been inhabited at least since the Stone Age. Conquered by Alexander the Great in 334 bc, it was incorporated into the Roman Empire by Augustus. As a city of the Byzantine Empire, Ankara fell to the Turks in 1073, but the Crusader Raymond IV of Toulouse drove them out in 1101. In 1403 it came under the rule of the Ottoman Empire. After World War I (1914-18) Mustafa Kemal AtatOrk made Ankara the centre of resistance to both the Ottomans and the invading Greeks, and it became the capital of the Republic of Turkey in 1923. The modern city is the country’s chief

industrial centre after Istanbul. Its history is displayed in its Roman,

Byzantine, and Ottoman architecture and ruins and in its important historical museums.

ankh \'aqk\ Ancient Egyptian hieroglyph signifying life, consisting of a cross surmounted by a loop. In tomb inscriptions, gods and pharaohs are often pictured holding the ankh, which forms part of the hieroglyph for concepts such as health and

happiness. It is used as a cross in the Coptic Orthodox Church.

Ankobra River River, southern Ghana. It rises northeast of Wiawso and flows about 130 mi (209 km) south to the Gulf of Guinea, just west of Axim. Its chief tributaries are the Mansi and Bonsa rivers; much of its basin is shared with the Tano River to the west.

Ann, Cape Cape northeast of Boston, Mass., U.S. Sheltering Ipswich Bay, it includes Annisquam Harbor on the north and Gloucester Harbor on the south. The rocky, picturesque promontory, named for Queen Anne (wife of James I), is noted for its old fishing villages and artists' colonies. Gloucester and Rockport are its main towns.

Ann Arbor City (pop., 2000: 114,024), southeastern Michigan, U.S. Founded in 1824, it became an agricultural centre with the coming of the railroad in 1839. The University of Michigan, which moved there from Detroit in 1837, has played a major role in Ann Arbor's growth. Private industrial research and the university's institutes of science and technology make the city a major Midwest centre for space and nuclear research.

Anna (Ivanovna) (b. Jan. 28, 1693, Moscow, Russia — d. Oct. 17, 1740, St. Petersburg) Empress of Russia (1730^40). After the death of Peter II, the Supreme Privy Council, Russia's actual ruling body, offered Anna the throne (as the daughter of Ivan V) if she agreed to conditions placing the real power in the council's hands. She initially agreed but later tore up the conditions, abolished the council, and reestablished the autocracy, countenancing a severely repressive regime. She occupied herself primarily with extravagant amusements and relied on her lover, Ernst Johann Biron (1690-1772), and a group of German advisers to manage the state. Shortly before her death, Anna named as her successor her grand-nephew Ivan (later Ivan VI).

Anna Comnena \kam-'ne-n9\ (b. Dec. 2, 1083 — d. c. 1153) Byzantine historian. Daughter of the emperor Alexius I Comnenus, she conspired with her mother against her brother John II Comnenus; when the plot was discovered, she was forced to enter a convent. There she wrote the Alexiad , a biography of her father and a pro-Byzantine account of the early Crusades.

Annaba \a-'na-b3\ formerly Bone \'bon\ Seaport (pop., 2004 est.: 410,700), northeastern Algeria. Identified with the port of ancient Hippo (or Hippo Regius), it was a rich city of Roman Africa. It was home to St. Augustine 396-430. Severely damaged by the Vandals in 431, it passed to the Byzantine Empire in 533 before being overrun by the Arabs in the 7th century and named Bona. It was occupied by the French in 1832 when they conquered Algeria. Modern Annaba is Algeria's chief exporter of minerals; it also serves as a trading port and port of call.

Annales \a-'nal\ school School of history. Established by Lucien Febvre (1878-1956) and Marc Bloch (1886-1944), its roots were in the journal Annales: economies, societes, civilisations, Febvre's reconstituted version of a journal he had earlier formed with Marc Bloch. Under Fernand Braudel's direction the Annales school promoted a new form of history, replacing the study of leaders with the lives of ordinary people and replacing examination of politics, diplomacy, and wars with inquiries into climate, demography, agriculture, commerce, technology, trans-

portation, and communication, as well as social groups and mentalities. While aiming at a “total history,” it also yielded dazzling microstudies of villages and regions. Its international influence on historiography has been enormous.

Annam \a-'nam\ Historic kingdom, central Vietnam. The area was conquered c. 200 bc by the Chinese, who gave it its name (which has never

The Ataturk Mausoleum, Ankara, Turkey.

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been used by the indigenous inhabitants). It became independent in the 15th century ad, opening the way for steady Vietnamese movement toward the Mekong River delta. When Vietnam was united in 1802, the city of Hue became the capital, and the area was ruled by the emperor of Annam. Central Vietnam gradually came under French control in the 19th century; it became a protectorate in 1883-85, leaving the court at Hue with only nominal power. The area was partitioned between North and South Vietnam in 1954; Annam’ s last emperor had abdicated in 1945 but served as Vietnam’s chief of state from 1949 until shortly after partition.

Annan \a-'nan\, Kofi (Atta) (b. April 8, 1938, Kumasi, Gold Coast) Seventh secretary-general of the United Nations (from 1997), who shared, with the UN, the 2001 Nobel Prize for Peace. He was the son of a provincial governor and hereditary paramount chief of the Fante people. He did graduate work at Geneva’s Institute for Advanced International Studies and at MIT. He has spent almost his entire career within the UN, beginning at the World Health Organization (1962). As undersecretary-general for peacekeeping (from 1993), he transferred peacekeeping operations in Bosnia from the UN to NATO. Elected in Decemberl996, he became the first UN secretary-general from sub-Saharan Africa, and he enjoyed a mandate to reform the UN bureaucracy. He criticized the UN’s failure to prevent or minimize genocide in Rwanda (1994) and unsettled many by declaring that the UN should address human-rights violations perpetrated by governments against their own people. His priorities included reforming the UN, restoring public confidence in the organization, and strengthening the UN’s activities for peace and development. Annan was appointed to a second term in 2001.

Annapolis \9-'na-p9-l9s\ City (pop., 2000: 35,838), capital of Maryland, U.S. It lies along the Severn River on Chesapeake Bay. Settled in 1649 as Providence by Virginia Puritans, it was later known as Town Land at Proctor’s and Ann Arundel Town. It became the colonial capital in 1694 and was later renamed to honour Princess (later Queen) Anne. Its economy is tied to government services, and it is home to the U.S. Naval

Academy.

Annapolis Convention (September 1786) Meeting in Annapolis, Md., U.S., that caused the convening of the Constitutional Convention. Delegates from five states gathered to discuss problems in maritime commerce but found they could not solve them without making changes to the Articles of Confederation. They issued a call to all states to meet in Philadelphia in 1787 to resolve the difficulties.

Annapurna Mountain range, Nepal. It forms a ridge 30 mi (48 km) long and contains four main summits. Annapurna I (26,545 ft, or 8,091 m) was first scaled in 1950 by a French expedition; it was the first peak of more than 26,000 ft (8,000 m) to be ascended to the summit. In 1970 an all-woman Japanese team climbed Annapurna III (24,786 ft, or 7,555 m).

Anne (b. Feb. 6, 1665, London, Eng. — d. Aug. 1, 1714, London) Queen of Great Britain (1702-14) and the last Stuart monarch. Second daughter of James II, who was overthrown by William III in 1688, Anne became queen on William's death (1702). Though she wished to rule independently, her intellectual limitations and poor health led her to rely on advisers, including the duke of Marlborough. Her reign was marked by the Act of Union with Scotland (1707) and by bitter rivalries between Whigs and Tories. Because she never gave birth to a successor, the regency passed to the Hanoverian descendants of James I.

Anne Boleyn \bu-'lin\ (b. 1507? — d. May 19, 1536, London, Eng.) British royal consort. After spending part of her childhood in France, Anne lived at the court of Henry VIII, who soon fell in love with her and began secret proceedings to rid himself of his first wife, Catherine of Aragon. For six years Pope Clement VII refused to grant an annulment. In 1533 Henry and Anne were secretly married, and Henry had the archbishop of Canterbury, Thomas Cranmer, annul his previous marriage. Anne gave birth to the future Elizabeth I but failed to produce the male heir Henry wanted. He lost interest in her, and in 1536 he had her imprisoned on questionable charges of adultery and incest. She was convicted and beheaded.

Anne of Austria (b. Sept. 22, 1601, Valladolid, Spain — d. Jan. 20, 1666, Paris, France) Queen consort (1615-43) of Louis XIII of France and regent (1643-51) for her son Louis XIV. Daughter of Philip III of Spain and Margaret of Austria, Anne married the 14-year-old Louis XIII in 1615. He treated her coolly, and the powerful cardinal de Richelieu attempted to limit her influence over her husband. After Louis XIII died and she was declared sole regent, she strove to ensure that her son would succeed to

the absolute power Richelieu had won for Louis XIII. Together with her first minister, Cardinal Mazarin, she faced the series of revolts known as the Fronde. Her regency ended in 1651, when Louis XIV was proclaimed of age to rule.

Anne of Brittany (b. Jan. 25,

1477, Nantes, France — d. Jan. 9,

1514, Blois) Duchess of Brittany and

twice queen consort of France. After succeeding to her father's duchy in 1488, Anne allied herself with Maximilian I of Austria. She was then forced to break with him and in 1491 marry Charles VIII of France, thus beginning the process of the union of Brittany with the French crown.

After Charles's death (1498), she married his successor, Louis XII.

Throughout her life Anne devoted herself to safeguarding Brittany's autonomy within the kingdom.

Anne of Cleves (b. Sept. 22, 1515 — d. July 16, 1557, London, Eng.) Fourth wife of Henry VIII of England. Henry married Anne, whom he found homely, to form an alliance with her brother William, duke of Cleves, a leader of the Protestants of western Germany. The alliance, arranged by Thomas Cromwell, seemed necessary because it appeared that the major Roman Catholic powers, France and the Holy Roman Empire, intended to attack Protestant England. When that threat dissipated, the marriage became a political embarrassment and was annulled by an Anglican convocation in 1540.

annealing Treatment of a metal, alloy, or other material by heating to a predetermined temperature, holding for a certain time, and then cooling to room temperature, done to improve ductility and reduce brittleness. Process annealing is carried out intermittently during the working of a piece of metal to restore ductility lost through repeated hammering or other working, if several cold-forming operations are required but the metal is so hardened after the first operation that further cold working would cause cracking (see hardening). Full annealing is done to give workability to such parts as forged blanks destined for use in the machine-tool industry. Annealing is also done for relief of internal stresses in metal and glass. Annealing temperatures and times differ for different materials and with properties desired; steel is usually held for several hours at about 1,260°F (680°C) and then cooled for several hours. See also heat treating, SOLID SOLUTION.

annelid Va-ns-.lidX Any member of a phylum (Annelida) of invertebrate animals that possess a body cavity (coelom), movable bristles (setae), and a body divided into segments by crosswise rings. Known as segmented worms, annelids are divided into three classes: marine worms (Polychaeta; see polychaete), earthworms (Oligochaeta), and leeches (Hirudinea). See illustration on following page.

Anne's War, Queen See Queen Anne's War

annihilation In physics, a reaction in which a particle and its antiparticle (see antimatter) collide and disappear. The annihilation releases energy equal to the original mass m multiplied by the square of the speed of light c, or E = me 2 , in accordance with Albert Einstein's special theory of relativity. The energy can appear directly as gamma rays or can convert back to particles and antiparticles (see pair production).

annual Any plant that completes its life cycle in a single growing season. The dormant seed is the only part of an annual that survives from one

growing season to the next. Annuals include many weeds, wildflowers, garden flowers, and vegetables. See also biennial, perennial.

annual ring See growth ring

annuity Payment made at a fixed interval. A common example is the payment received by retirees from their pension plan. There are two main classes of annuities: annuities certain and contingent annuities. Under an annuity certain, a specified number of payments are made, after which the annuity stops. With a contingent annuity, each payment depends on the continuance of a given status; for example, a life annuity continues only

Anne of Austria, detail of a portrait by Peter Paul Rubens; in the Rijksmuseum, Amsterdam.

ART MEDIA/HERITAGE-IMAGES

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ventral

blood

nephridia

gizzard

setae ^^ dorsa|

blood mtes,lne

hearts eso P^ a 9 us vessel septa

srebral \\

anglion \\v ^-V\

louth ' y ventral vessel
nerve cord

'clitellum
circular muscle
longitudinal muscle

anus

Body plan of an earthworm. Partitions (septa) divide the body cavity (coelom) into more than 1 00 segments. The circular and longitudinal muscles work with the setae to move the worm forward. Soil is pulled into the mouth by the sucking action of the pharynx; the crop releases food slowly into the gizzard, where the soil is ground to release and break up any organic matter. The cerebral ganglion, or "brain," controls all body functions and movement via a ventral nerve cord. Contraction of the hearts (aortic arches) and ventral blood vessel forces blood through the body; blood returns via the dorsal blood vessel. Nitrogenous waste is eliminated through the tubules of the nephridia, while digested soil is pushed through the intestine and out the anus. The clitellum secretes mucus for mating and a cocoon in which eggs are deposited.

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as long as the recipient survives. Contingent annuities such as pension plans or life insurance depend on shared risk. Everyone pays in a fixed amount until the annuity begins; some will not live long enough to receive back all the money they have paid, while others will live long enough to collect more than they have paid.

annulment Legal invalidation of a marriage. It announces the invalidity of a marriage that was void from its inception. It is to be distinguished from dissolution or divorce. To justify annulment, the marriage contract must have a defect (e.g., incompetence of one party because of age, insanity, or a preexisting marriage). Continued absence of one party may also justify annulment. Generally, annulment is easier if the marriage is unconsummated. Both secular law and Christian canon law have annulment procedures.

anode Terminal or electrode from which electrons leave a system. In a battery or other source of direct current, the anode is the negative terminal. In a passive load it is the positive terminal. In an electron tube, electrons from the cathode travel across the tube toward the anode; in an electroplating cell, negative ions are deposited at the anode.

anodizing Method of coating metal for corrosion resistance, electrical insulation, thermal control, abrasion resistance, sealing, improving paint adhesion, and decorative finishing. Anodizing consists of electrically depositing an oxide film from aqueous solution onto the surface of a metal, often aluminum, which serves as the anode in an electrolytic cell. In the most common type of anodizing, which uses a 15% sulfuric acid bath, dyes can be introduced into the oxidation process to achieve a coloured surface. Aluminum thus anodized and coloured is used widely in giftware, home appliances, and architectural decoration.

anomie Va-no-meV In the social sciences, a condition of social instability or personal unrest resulting from a breakdown of standards and values or from a lack of purpose or ideals. The term was introduced in 1897

by Emile Durkheim, who believed that one type of suicide (anomic) resulted from the breakdown of social standards that people need and use to regulate their behavior. Robert K. Merton studied the causes of anomie in the U.S., finding it severest in persons who lack acceptable means of achieving their cultural goals. Delinquency, crime, and suicide are often reactions to anomie. See also alienation.

anorexia nervosa X.a-no-'rek-se-o-nor-'vo-soV Eating disorder, mostly in young women, characterized by a failure to maintain body weight at a normal level because of an intense desire to be thin, a fear of gaining weight, or a disturbance in body image. Anorexia nervosa typically begins in late adolescence. In women a usual symptom is amenorrhea. A person with anorexia nervosa will often go to great lengths to resist eating in order to lose weight, and medical complications can be life-threatening. Treatment can include psychological and social therapy.

anorthite Feldspar mineral, calcium aluminosilicate (CaAl 2 Si 2 0 8), that occurs as white or grayish, brittle, glassy crystals. Primarily a rock-forming mineral, it is used in the manufacture of glass and ceramics. Anorthite occurs in basic igneous rocks (see acid and basic rocks).

anorthosite Type of igneous rock composed predominantly of calcium-rich feldspar. It is considerably less abundant than either basalt or granite, but the complexes in which it occurs are often immense. All anorthosites found on the earth consist of coarse crystals, but some from the moon are finely crystalline.

Anouilh \a-'nuy\, Jean (-Marie-Lucien-Pierre) (b. June 23, 1910, Bordeaux, France — d. Oct. 3, 1987, Lausanne, Switz.) French playwright. After studying law, he wrote his first play. The Ermine (1932), followed by the successful Traveler Without Luggage (1937). He is best remembered for Antigone (1944), The Lark{ 1953), and Becket (1959), in which he used techniques such as the play within the play, flashbacks and flash-forwards, and the exchange of roles. A skillful exponent of the well-made play, he rejected naturalism and realism in favour of a return to theatricausm.

Ansar Arabic "Helper" Term originally applied to some of the Companions of the Prophet. When Muhammad left Mecca for Medina, the Ansar were the Medinese who aided him and who became his devoted followers, serving in his army. The term was revived in the 19th century to refer to the followers of the Sudanese al-MAHDi, al-Mahdi’s successor, or his descendants.

Anschluss \'an-,shlus\ (German: “union”) Political union of Austria with Germany, which occurred when Adolf Hitler annexed Austria. In 1938 the Austrian chancellor Kurt von Schuschnigg was bullied into canceling a plebiscite on union with Germany, which he expected Austrians to oppose. He resigned his office and ordered the Austrian army not to resist the Germans. The Germans invaded on March 12, and the enthusiasm shown by Austrians persuaded Hitler to annex Austria outright the next day. Though France and Britain protested Hitler’s methods, they and other countries accepted the fait accompli.

Anselm of Canterbury, Saint (b. 1033/34, Aosta, Lombardy — d. April 21, 1109, possibly at Canterbury, Kent, Eng.; feast day April 21) Founder of Scholasticism. Anselm entered the Benedictine monastery at Bee (in Normandy) in 1057 and became abbot in 1078. In 1077 he wrote

the Monologium to demonstrate God’s existence and attributes by reason alone. He then wrote Proslogium, which established the ontological argument for the existence of God. In 1093, he became archbishop of Canterbury and soon became involved in disputes with William II over the independence of the church and the right to appeal to the pope, arguments that led to Anselm’s exile. Although invited back by Henry I, Anselm again argued with the king over lay investiture (see Investiture Controversy). In 1099 he completed Cur Deus homo? (“Why Did God Become Man?”), which provided a new understanding of Jesus’ redemption of humankind and revealed the increasing focus on the humanity of Jesus. Anselm was declared a Doctor of the Church in 1720.

Ansgar Vans-.garV, Saint (b. probably 801, near Corbie, Austrasia — d. Feb. 3, 865, Bremen, Saxony; feast day February 3) Missionary, first archbishop of Hamburg, and patron saint of Scandinavia. He was sent by Louis I (the Pious) to help King Harald Christianize Denmark and King Bjorn Christianize Sweden. He initiated a mission to all Scandinavians and Slavs and was appointed archbishop of Hamburg (832). But Sweden and Denmark returned to paganism by 845, and Ansgar had to repeat all his work. He thwarted another pagan rebellion and was recognized as a saint soon after his death.

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Anshan \'an-,shan\ City and territory of ancient Elam, north of modern Shiraz, Iran. Anshan came to prominence c. 2350 bc, but its greatest period was in the 13th- 12th centuries bc, when, as kings of Anshan and Susa, Elamite rulers periodically raided the cities of Babylonia. The area apparently came under the control of the Persians c. 675 bc. Its ruins have yielded major finds, including examples of early Elamite writing.

Anshan Van-'shan\ or An-shan City (pop., 1999 est.: 1,285,849), Liaoning province, northeastern China. Established as a post station in 1387, it was fortified in 1587 as part of the defenses set up by the Ming dynasty against the rising power of the Manchus. It was destroyed by fire during the Boxer Rebellion and badly damaged during the Russo-Japanese War (1904-05). In the 1930s the Japanese occupied Anshan and made it a steel-making centre. The city was bombed by U.S. aircraft in 1944 and looted by the Soviets following World War II. The Chinese later redeveloped it into an industrial centre that produces steel, cement, and chemicals.

ant Any member of approximately 8,000 species of the social insect family Formicidae. Ants are found worldwide but are especially common in hot climates. They range from 0. 1 to 1 in. (2-25 mm) long and are usually yellow, brown, red, or black. Ants eat both plant and animal substances; some even “farm” fungi for food, cultivating them in their nests, or “milk” aphids. Ant colonies

consist of three castes (queens, males, and workers, including soldiers) interacting in a highly complex society paralleling that of the honeybees. Well-known ant species America, the voracious army ants of tropical America, and the stinging FIRE ANT.

antacid Any substance, such as sodium bicarbonate, magnesium hydroxide, or aluminum hydroxide, used to relieve the discomfort caused by indigestion, gastritis, and several forms of ulcers. Antacids counteract or neutralize gastric acidity for up to three hours after a single dose. Antacids should be taken when gastric acidity is most likely to be increasing — namely, between one and three hours after each meal and at bedtime.

Antakya See Antioch

Antananarivo V.an-ta-.na-na-'re-voV formerly Tananarive \ta-,na-na-'rev\ City (pop., 2001 est.: 1,403,449), capital of Madagascar. Located in central Madagascar Island, and rising to an elevation of 4,694 ft (1,431 m), the city was founded in the 17th century and was controlled by the Merina from the early 1790s until the end of the 19th century. The French made it the capital of their colony when they took control of the region at the end of the 19th century and renamed it Tananarive. The name became Antananarivo after the 1972 revolution. The University of Madagascar (1961) is located there, as are tobacco- and food-processing plants. A railway connects it with Toamasina, the island’s chief port.

Antarctic Circle Parallel of latitude approximately 66.5° south of the Equator that circumscribes the southern frigid zone. It marks the northern limit of the area within which, for one day or more each year, the sun does not set or rise. The length of continuous day or night increases southward from the Antarctic Circle, mounting to six months at the South Pole.

Antarctic regions Antarctica and the southern portions of the Pacific, Atlantic, and Indian oceans. The waters around Antarctica are sometimes called the Southern Ocean; however, the term “Antarctic Ocean” is sometimes also used, inappropriately. Much of the area is characterized by subpolar conditions, and ice shelves and sea ice extend well beyond the borders of the continent. Water cooled by the coastal ice masses of the Antarctic continent sinks and flows northward along the ocean bottom and is replaced at the surface by warmer water flowing south from the Indian, Pacific, and Atlantic oceans. The meeting point of these currents is the Antarctic Convergence, an area rich in phytoplankton and krill, which are important to various species of fish as well as to penguins and seabirds.

Antarctica Fifth largest continent on Earth. Antarctica lies concentrically about the South Pole, its landmass almost wholly covered by a vast ice sheet averaging 6,500 ft (2,000 m) thick. It is divided into two subcontinents: East Antarctica, consisting mainly of a high, ice-covered plateau, and West Antarctica, consisting largely of an archipelago of

Carpenter ant (Camponotus)

GRACE THOMPSON FROM THE NATIONAL AUBUDON SOCIETY COLLECTION -PHOTO RESEARCHERS/EB INC.

are the carpenter ants of North

mountainous islands covered with ice. Its land area is about 5.5 million sq mi (14.2 million sq km). The southern portions of the Atlantic, Pacific, and Indian oceans surround it (see Antarctic regions). Antarctica would be circular except for the outflaring Antarctic Peninsula and two principal bays, the Ross Sea and the Weddell Sea. East and West Antarctica are separated by the long chain (1,900 mi [3,000 km]) of the Transantarctic Mountains. The ice sheet overlaying the continent represents about 90% of the world's glacial ice. By far the coldest continent, it has the world's lowest recorded temperature, -128.6 °F (-89.2 °C), measured in 1983. The climate supports only a small community of land plants, but the rich offshore food supply sustains penguins and immense seabird rookeries. There are no permanent human inhabitants. The Russian F.G. von Bellingshausen (b. 1778 — d. 1852), the Englishman Edward Bransfield (b. 1795? — d. 1852), and the American Nathaniel Palmer (b. 1799— d. 1877) all claimed first sightings of the continent in 1820. The period to c. 1900 was dominated by the exploration of Antarctic and sub-Antarctic seas. The early 20th century, the "heroic era" of Antarctic exploration, produced expeditions deep into the interior by Robert Falcon Scott and later Ernest Shackleton. The South Pole was reached by Roald Amundsen in December 1911 and by Scott in January 1912. The first half of the 20th century was also Antarctica's colonial period. Seven nations claimed sectors of the continent, while many other nations carried out explorations. In the International Geophysical Year of 1957-58, 12 nations established over 50 stations on the continent for cooperative study. In 1961 the Antarctic Treaty, reserving Antarctica for free and nonpolitical scientific study, entered into full force. A 1991 agreement imposed a ban on mineral exploitation for 50 years.

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anteater Any of four species of toothless, insect-eating placental mammals. Found in tropical savannas and forests from Mexico to northern Argentina and Uruguay, anteaters have a long tail, dense fur, a long skull, and a tubular muzzle. Their mouth opening is small, and the tongue is long and wormlike. They live alone or in pairs and feed mainly on ants and termites, which they obtain by inserting their sticky tongue into a nest torn open by the long, sharp, curved claws of their forefeet. The species range in length from 15 in. (37 cm) to 6 ft (1.8 m). Once grouped together, anteaters are now considered as separate from echidnas and pangolins.

Antelami X.an-te-'la-meV, Benedetto (b. c. 1150, probably Lombardy — d. c. 1230, Parma) Italian sculptor and architect. He probably belonged to the Magistri Antelami, a civic builders' guild in the Lake Como region. An early signed marble relief by him, The Descent from the Cross (1178), is in Parma Cathedral; his extensive cycle of sculpture on the baptistery at Parma was begun in 1196. He is credited with the sculptural decorations of Fidenza Cathedral and Ferrara Cathedral. His last work is believed to have been the decoration and (at least in part) the construction of the church of Sant' Andrea at Vercelli, the architecture of which successfully combined Tuscan Romesque with Gothic characteristics (such as flying buttresses, rose windows, and ribbed vaulting) and won him lasting renown.

antelope Any of numerous species of Old World grazing or browsing bovids that typically are swift, slender, and graceful plains dwellers. The North American pronghorn is also sometimes referred to as an antelope. Most antelope are African; the others, except for the pronghorn, are Eurasian. They range in shoulder height from 10 to 70 in. (25-175 cm). The male, and sometimes the female, bears distinctive, backwardly curved horns. See also bongo, dik-dik, duiker, eland, gazelle, gnu, hartebeest, impala,

KUDU, NYALA, ORYX, SPRINGBOK, WATERBUCK.

antenna or aerial Component of radio, television, and radar systems that directs incoming and outgoing radio waves. Usually of metal, antennas range in shape and size from the mastlike devices used for radio and television broadcasting to the large parabolic reflectors used to focus satellite signals and the radio waves generated by distant astronomical objects and reflect them toward the centrally located receiver. Antennas were invented in the 1880s by Heinrich Hertz; Guglielmo Marconi made many improvements.

antenna In zoology, one of a pair of slender, segmented sensory organs on the head of insects, myriapods (e.g, centipedes, millipedes), and crustaceans. Antennae of insects, which are movable, are believed to serve as both tactual and smell receptors; in some species, the development of elaborate antennal plumes and brushlike terminations has led to the suggestion that they also serve for hearing. Evidence supports this idea only for the mosquito, whose antennae are attached to specialized structures stimulated by vibrations of the antennal shaft. In social insects (e.g., ants), antennae movements may serve as communication.

Antenor \an-'te-nor\ (fl. c. 530-5 10 bc) Greek sculptor active in Athens. In antiquity he was famous for his bronze group of the Tyrannicides (c. 510 bc) made for the Athenian agora; the statues no longer exist. There were elements of motion and accurate anatomical detail in the work that mark the transition between the Archaic and Classical eras. A large marble kore (c. 520 bc) from the Acropolis, found in 1886, is also attributed to him and is considered one of the finest examples of late Archaic sculpture.

anthem Choral composition with English words used in church services. It developed in the mid- 16th century as the Anglican version of the Catholic Latin motet. The full anthem is for unaccompanied chorus throughout; the verse anthem employs one or more soloists and, generally, instrumental accompaniment. Both types often employ antiphonal singing, the alternation of two half-choirs (anthem derives from antiphon). William Byrd, Thomas Talus, Henry Purcell, and George Frideric Handel wrote

well-known anthems.

Anthesteria \,an-th3-'stir-e-9\ Athenian festival in honor of Dionysus, held during the month of Anthesterion (Feb.-Mar.) to celebrate the beginning of spring and the maturing of the wine stored at the previous vintage. It lasted three days and included libations to the god from newly opened casks, popular merrymaking, a secret ceremony of marriage between Dionysus and the wife of the king, and underworld rites.

Anthony, Susan B(rownell) (b. Feb. 15, 1820, Adams, Mass., U.S. — d. March 13, 1906, Rochester, N.Y.) U.S. pioneer in the women's suffrage movement. A precocious child, she learned to read and write at the age of three. After attending a boarding school in Philadelphia, she took a teaching position in a Quaker seminary in upstate New York. She taught at a female academy (1846-49) and then settled in her family home near Rochester, N.Y. There she met many leading abolitionists, including Frederick Douglass and William Lloyd Garrison. The rebuff of her attempt to speak at a temperance meeting in Albany in 1852 prompted her to join Elizabeth Cady Stanton in organizing the Woman’s State Temperance Society of New York. From this time she was a tireless campaigner for abolition and women’s rights. During the early phase of the Civil War she helped organize the Women’s National Loyal League, which urged the case for emancipation. After the war, she campaigned unsuccessfully to have the language of the Fourteenth Amendment altered to allow for woman as well as “Negro” suffrage. In 1868 she represented the Working Women’s Association of New York, which she had recently organized, at the National Labor Union convention. In January 1869 she organized a woman suffrage convention in Washington, D.C., and in May she and Stanton formed the National Woman Suffrage Association (NWSA). As a test of the legality of the suffrage provision of the Fourteenth Amendment, she cast a vote in the 1872 presidential election in Rochester. She was arrested, convicted (the judge’s directed verdict of guilty had been written before the trial began), and fined; though she refused to pay the fine, the case was carried no further. She served as president of the National American Woman Suffrage Association (1892-1900) and lectured throughout the country for a federal women’ s-suffrage amendment.

Anthony of Egypt, Saint (b. 251, Koma, near al-Minya, Heptanomis, Egypt — d. Jan. 17?, 356, Dayr Mari Antonios hermitage, near the Red Sea; feast day January 17) Egyptian hermit considered the founder of organized Christian monasticism. He began his practice of asceticism at age 20 and lived in solitude on Mount Pispir from 286 to 305. He emerged from his retreat to organize the monastic life of the hermits who had settled nearby. When the Edict of Milan (313) ended the persecution of Christians, Anthony moved to the desert between the Nile and the Red

Sea. His monastic rule was compiled from writings and discourses attributed to him in Athanasius's Life of St. Anthony and the Apophthegmata patrum and was still observed in the 20th century by Coptic and Armenian monks. The hellish temptations he endured as a hermit became a popular subject for artists.

Anthony of Padua, Saint (b. 1195, Lisbon, Port. — d. June 13, 1231, Arcella, Verona; canonized 1232; feast day June 13) Franciscan friar. Doctor of the Church, and patron saint of Portugal. He joined the Augustinian order in 1210 and was probably ordained a priest. He joined the Franciscans in 1220 with the goal of seeking martyrdom among the Muslims but instead became a teacher of theology in Bologna, Italy, and in southern France. The most beloved of the followers of St. Francis, he was known as a great preacher and miracle worker. He was buried in Padua, Italy, and he is the patron of that city. He is also invoked for the return of lost property.

anthophyllite ^an-ths-'fi-llri Amphibole mineral, a magnesium and iron silicate that occurs in altered rocks, such as the crystalline schists of Kongsberg, Norway; southern Greenland; and Pennsylvania. Anthophyllite is commonly produced by regional metamorphism of ultrabasic rocks (see ACID AND BASIC ROCKS).

anthracite or hard coal Coal containing more fixed carbon than any other form of coal and the lowest amount of volatile (quickly evaporating) material, giving it the greatest heat value. The most valuable of the coals, it is also the least plentiful, making up less than 2% of all coal reserves in the U.S., with most of the known deposits occurring in the East. Anthracites are black and have a brilliant, almost metallic lustre. Hard and brittle, they can be polished and used for decorative purposes. They are difficult to ignite but burn with a pale-blue flame and require little attention to sustain combustion. In the past they were used for

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domestic heating, but today they have given way to other sources of energy (e.g., natural gas and electricity).

anthracnose \an-'thrak-,nos\ Plant disease of warm humid areas, caused by a fungus (usually Colletotrichum or Gloeosporium). It infects various plants, from trees to grasses. Symptoms include sunken spots of various colours in leaves, stems, fruits, or flowers, often leading to wilting and dying of tissues. Dogwood anthracnose, caused by the fungus Discula destructive i, thrives in cool climates; in the U.S. it has caused severe losses to natural stands of dogwoods in mountainous regions. It is controlled by destroying diseased tree tissue, using disease-free seed and disease-resistant varieties, applying fungicides, and controlling insects and mites that spread anthracnose fungi from plant to plant.

anthrax \'an-,thraks\ Infectious disease of warm-blooded animals,

caused by Bacillus anthracis, a bacterium that, in spore form, can retain its virulence in contaminated soil or other material for many years. A disease chiefly of herbivores, the infection may be acquired by persons handling the wool, hair, hides, bones, or carcasses of affected animals. Infection may lead to death from respiratory or cardiac complications (within 1-2 days if acute), or the animal may recover. In humans, anthrax occurs as a cutaneous, pulmonary, or intestinal infection. The most common type, which occurs as an infection of the skin, may lead to fatal septicemia (blood poisoning). The pulmonary form of the disease is usually fatal. Sanitary working environments for susceptible workers are critical to preventing anthrax; early diagnosis and treatment are also of great importance. In recent decades, various countries have attempted to develop anthrax as a weapon of biological warfare; many factors, including its extreme potency (vastly greater than any chemical-warfare agent), make it the preferred biological-warfare agent. Concerns about anthrax mounted in 2001 after it was found in letters mailed to members of the U.S. government and news agencies.

anthropology The “study of humanity.” Anthropologists study human beings in aspects ranging from the biology and evolutionary history of Homo sapiens to the features of society and culture that decisively distinguish humans from other animal species. Because of the diverse subject matter it encompasses, anthropology has become, especially since the middle of the 20th century, a collection of more specialized fields. Physical anthropology is the branch that concentrates on the biology and evolution of humanity. The branches that study the social and cultural constructions of human groups are variously recognized as belonging to cultural anthropology (or ethnology), social anthropology, linguistic anthropology, and psychological anthropology. Archaeology, as the method of investigation of prehistoric cultures, has been an integral part of anthropology since it became a self-conscious discipline in the latter half of the 19th century.

anthroposophy V.an-thro-'pa-so-foV Philosophy based on the view that the human intellect has the ability to contact spiritual worlds. It was formulated in the early 20th century by Rudolf Steiner and was influenced by theosophy. Steiner wanted to develop a faculty for spiritual perception independent of the senses, which he believed was latent in all human beings, and to this end he founded the Anthroposophical Society in 1912. Now based in Dornach, Switzerland, the society has branches worldwide.

anthurium Xan-'thur-e-omX Any plant of the genus Anthurium , comprising about 600 tropical herbaceous species in the arum family, many of which are popular foliage plants. A few species are widely grown for the florist trade for their showy, long-lasting blossoms; these include the flamingo lily {A. andraeanum), which boasts a salmon-red flower, and the flamingo flower, or pigtail plant (A. scherzeranum), which has a scarlet flower.

Anti-Comintern Pact Agreement concluded first between Germany and Japan (Nov. 25, 1936) and later between Italy, Germany, and Japan (Nov. 6, 1937). The pact, sought by Adolf Hitler, was ostensibly directed against the Comintern but was specifically directed against the Soviet Union. It was one of a series of agreements leading to the formation of the Axis Powers. Japan renounced the pact in 1939 but later acceded to the Tripartite Pact of 1940, which pledged Germany, Japan, and Italy to mutual assistance.

Anti-Corn Law League British organization founded in 1839, devoted to fighting England's Corn Laws, regulations governing the import and export of grain. It was led by Richard Cobden, who saw the laws as both morally wrong and economically damaging. The league mobilized the industrial middle classes against the landlords, and Cobden won over the prime minister, Sir Robert Peel. The Corn Laws were repealed in 1846.

Anti-Federalists U.S. leaders who opposed the strong central government envisioned in the Constitution of the United States of 1787. Their agitation led to the creation of the Bill of Rights. While admitting the need for changes in the Articles of Confederation, they feared that a strong federal government would infringe on states' rights. The group's adherents, including George Mason, Patrick Henry, Thomas Paine, Samuel Adams, and George Clinton, were as numerous as the members of the Federalist Party, but their influence was weak in urban areas, and only Rhode Island and North Carolina voted against ratification of the Constitution. Anti-Federalists were powerful during the presidency of Thomas Jefferson, when they formed the nucleus of what later became the Democratic Party.

Anti-Lebanon Mountains Mountain range along the border of Syria and Lebanon. Running parallel to the Lebanon Mountains, the range averages 6,500 ft (2,000 m) in elevation. Because of its poor soil and steep slopes, it is sparsely populated.

Anti-Masonic Movement Popular movement in the U.S. in the 1830s opposed to Freemasonry. The movement was ignited in 1826 by the disappearance and presumed murder of a New York bricklayer and former Mason, who had supposedly intended to reveal the order's secrets. Reaction against the Masons swept through the northeastern U.S. In 1831 the Anti-Masonic Party became the first U.S. third party and the first party to hold a national convention. It condemned Freemasonry for its secrecy and undemocratic character. Its candidate won Vermont in the 1832 election. By the late 1830s the Anti-Masonic movement had been absorbed into the Whig Party.

anti-Semitism Hostility toward or discrimination against Jews as a religious group or "race." Although the term anti-Semitism has wide currency, it is regarded by some as a misnomer, implying discrimination against all Semites, including Arabs and other peoples who are not the targets of anti-Semitism as it is usually understood. In antiquity, hostility to the Jews emerged because of religious differences, a situation worsened as a result of the competition with Christianity. By the 4th century, Christians tended to see Jews as an alien people whose repudiation of Christ had condemned them to perpetual migration. Jews were denied citizenship and its rights in much of Europe in the Middle Ages (though some societies were more tolerant) or were forced to wear distinctive clothing, and there were forced expulsions of Jews from several regions in that period. Developed during the Middle Ages were many of the stereotypes of Jews (e.g., the blood libel, alleged greed, conspiracy against humankind) that have persisted into the modern era. The Enlightenment and the French Revolution brought a new religious freedom to Europe in the 18th century but did not reduce anti-Semitism, because Jews continued to be regarded as outsiders. In the 19th century violent discrimination intensified (see pogrom), and so-called "scientific racism" emerged, which based hostility to the Jews on their supposed biological character-

istics and replaced religion as the primary basis for anti-Semitism. In the 20th century the economic and political dislocations caused by World War I intensified anti-Semitism, and racist anti-Semitism flourished in Nazi Germany. Nazi persecution of the Jews led to the Holocaust, in which an estimated six million Jews were exterminated. Despite the defeat of the Nazis in World War II, anti-Semitism remained a problem in many parts of the world into the 21st century.

Anti-Slavery Society, American See American Anti-Slavery Society

antiaircraft gun Artillery piece fired from the ground or shipboard in defense against aerial attack. They were first used in combat in World War I, when field artillery were converted to antiaircraft use by mountings that enabled them to fire nearly vertically. Range finders and searchlights, developed in the 1920s and ’30s, increased their effectiveness. Advances in World War II included rapid-firing and automatic weapons, radar for target tracking, and radio-operated fuses. British and U.S. forces used a 40-mm gun that fired ammunition to a height of 2 mi (3.2 km). Heavier guns, up to 120 mm, were used against high-flying bombers. For most of the war, the most effective was the German 88-mm Fliegerabwehrkanone\ its abbreviated name, flak, became a universal term for antiaircraft fire. With the introduction of guided missiles in the 1950s and ’60s, heavy antiaircraft guns were phased out, though lighter radar-guided automatic guns remained effective against low-flying aircraft and helicopters.

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antiballistic missile (ABM) Weapon designed to intercept and destroy ballistic missiles. Effective ABM systems have been sought since the Cold War, when the nuclear arms race raised the spectre of complete destruction by unstoppable ballistic missiles. In the late 1960s both the U.S. and the Soviet Union developed nuclear- armed ABM systems that combined a high-altitude interceptor missile (the U.S. Spartan and Soviet Galosh) with a terminal-phase interceptor (the U.S. Sprint and Soviet Gazelle). Both sides were limited by the 1972 Treaty on Antiballistic Missile Systems to one ABM location each; the U.S. dismantled its system, while the Soviet Union deployed one around Moscow. During the 1980s the U.S. began research on an ambitious Strategic Defense Initiative against an all-out Soviet attack, but this effort proved expensive and technically difficult, and it lost urgency with the collapse of the Soviet Union. Attention shifted to “theatre” systems such as the U.S. Patriot missile, which was used with limited effect against conventionally armed Iraqi Scud missiles during the Persian Gulf War (1990-91). In 2002 the U.S. formally withdrew from the ABM treaty in order to develop a defense against limited missile attack by smaller powers or “rogue” states.

Antibes \a n -'teb\ ancient Antipolis Seaport (pop., 1999: 72,412), southeastern France. Located on the Mediterranean coast southwest of Nice, it was a Greek trading post established by Phocaeans c. 340 bc. It became a Roman town and eventually a fief of the Grimaldi family (see

Monaco) from 1384 to 1608. It is noted as a winter resort and for its Roman ruins.

antibiotic Chemical substance that in dilute solutions can inhibit the growth of microorganisms or destroy them with little or no harm to the infected host. Early antibiotics were natural microbial products, but chemists have modified the structures of many to produce semisynthetic and even wholly synthetic ones. Since the discovery of penicillin (1928), antibiotics have revolutionized the treatment of bacterial, fungal, and some other diseases. They are produced by many actinomycetes (e.g., streptomycin, tetracycline) and other bacteria (e.g., polypeptides such as bacitracin) and by fungi (e.g., penicillin). Antibiotics may be broad-spectrum (active against a wide range of pathogens) or specific (active against one, or one class). Drawbacks include activity against beneficial microorganisms, often causing diarrhea; allergies; and development of drug-resistant strains of the targeted microorganisms.

antibody Molecule in the immune system that circulates in blood and lymph in response to invasion by an antigen. Antibodies are globulins formed in lymphoid tissues by B cells, whose receptors are specialized to bind to a specific antigen. These receptors are copied as antibodies that attack the target antigens by binding to them, either neutralizing them or triggering a complement reaction. Antibodies have widely varying binding sites, providing protection from a wide range of infectious agents and toxic substances. Antibodies derived from the blood serum of infected people or animals are often given in an antiserum for quick immunization against fast-acting toxins or microbes. In 1975 Cesar Milstein and colleagues developed a process for producing specific antibodies in virtually limitless amounts; these monoclonal antibodies can deliver radiation or drugs directly to specific antigens. See also antitoxin; reticuloendothelial SYSTEM.

Antichrist Chief enemy of Christ who would reign at the end of time, first mentioned in the epistles of St. John. The idea of a mighty ruler who will appear at the end of time to fight against the forces of good was adapted from Judaism; the Jewish concept in turn had been influenced by Iranian and Babylonian myths of the battle of God and the devil at the end of time. In the Book of Daniel the evil one is a military leader modeled on Antiochus IV Epiphanes, who persecuted the Jews. In several books of the New Testament, the Antichrist is a tempter who works by signs and wonders and seeks divine honors. It was a potent concept in medieval Christianity that received the attention of many commentators including Adso of Montier-en-Der, whose work became the basic medieval treatise on the Antichrist. During the Middle Ages, popes and emperors struggling for power often denounced each other as the Antichrist, and during the Reformation, Martin Luther and other Protestant leaders identified the papacy itself as the Antichrist.

anticoagulant Substance that prevents blood from clotting by suppressing the synthesis or function of various clotting factors (see coagulation). Anticoagulants are given to prevent thrombosis and used in drawing and storing blood. There are two main types of anticoagulants: heparin and vitamin K antagonists (e.g., warfarin). The latter have longer-

lasting effects, interfering in the liver’s metabolism of vitamin K to cause production of defective clotting factors. Anticoagulant therapy carries a high risk of uncontrollable hemorrhage.

Anticosti Island Island, Gulf of St. Lawrence. Lying at the mouth of the St. Lawrence River in southeastern Quebec, it is 140 mi (225 km) long; its greatest width is 35 mi (56 km). Visited by Jacques Cartier in 1534, it became part of Quebec province in 1774. Port-Menier is its present-day — and only — settlement. It is now primarily a recreation area.

antidepressant Any drug used to treat depression. The three main types inhibit the metabolism of serotonin and norepinephrine in the brain. The aim is to keep these monoamine neurotransmitters from dropping to levels associated with depression. The drugs may take a few weeks to show any effect. Tricyclic antidepressants, which inhibit inactivation of norepinephrine and serotonin, help more than 70% of patients. Monoamine oxidase (MAO) inhibitors apparently block the action of MAO, an enzyme that helps break down norepinephrine, serotonin, and dopamine in neurons. They have unpredictable side effects and are usually given only when tricyclic drugs do not help. Selective serotonin reuptake inhibitors (SSRIs) apparently block reabsorption only of serotonin, allowing its levels to build up in the brain. SSRIs, which include fluoxetine (trade name Prozac), often help with depression unrelieved by tricyclics or MAO inhibitors and have milder side effects.

antidote Remedy to counteract the effects of a poison or toxin. Administered by mouth, intravenously, or sometimes on the skin, it may work by directly neutralizing the poison; causing an opposite effect in the body; binding to the poison to prevent its absorption, inactivate it, or keep it from fitting a receptor at its site of action; or binding to a receptor to prevent the poison’s binding there, blocking its action. Some poisons are not active until converted to a different form in the body; their antidotes interrupt that conversion.

Antietam \an-'te-t3m\. Battle of (Sept. 17, 1862) Decisive and bloody battle of the American Civil War that halted the Confederate advance on Maryland. Following victory in the Second Battle of Bull Run, Gen. Robert E. Lee moved his troops into Maryland with an eye to capturing Washington, D.C. They were stopped by Union troops under George B. McClellan at Antietam Creek, Md. Confederate casualties numbered some 13,700, and Union losses were about 12,400. McClellan was criticized for allowing Lee’s forces to retreat to Virginia, but the victory encouraged Pres. Abraham Lincoln to issue a preliminary Emancipation Proclamation.

antifreeze Any substance that lowers the freezing point of water, protecting a system from the ill effects of ice formation. Antifreezes such as ethylene glycol or propylene glycol commonly added to water in automobile cooling systems prevent damage to radiators. Additives to prevent freezing of water in gasoline (e.g., Drygas) usually contain methanol or isopropanol. Organisms that must survive freezing temperatures use various chemicals to inhibit ice crystal formation in their cells and tissues: glycerol or dimethyl sulfoxide in insects, glycerol or trehalose in other invertebrates (nematodes, rotifers), and proteins in Antarctic fishes.

antigen Van-ti-jsnN Foreign substance in the body that induces an immune response. The antigen stimulates lymphocytes to produce antibodies or to attack the antigen directly (see antibody;immunity). Virtually any large foreign molecule can act as an antigen, including those of bacteria, viruses, parasites, foods, venoms, blood components, and cells and tissues of various species, including other humans. Sites on the antigen’s

surface fit and bind to receptor molecules on the lymphocytes' surface, stimulating the latter to multiply and initiate an immune response that neutralizes or destroys the antigen.

Antigone \an-'ti-go-ne\ In Greek legend, the daughter born of the incestuous relationship between Oedipus and his mother, Jocasta. After Oedipus had blinded himself in self-punishment, Antigone and her sister Ismene served as his guides, following him into exile. When he died, Antigone returned to Thebes, where her brothers Eteocles and Polyneices were at war. Both were killed, and Creon, the new king, declared that because Polyneices was a traitor, his corpse should remain unburied. Unwilling to let the body be defiled, Antigone buried him; when Creon condemned her to death, she hanged herself. Her story was dramatized by Sophocles and Euripides (in Euripides' version she escapes and joins her beloved, Haemon).

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Antigonid dynasty (306-168) Ruling house of ancient Macedonia. Antigonus I was proclaimed king in 306 bc after his son Demetrius conquered Cyprus, thus giving his father control of the Aegean, the eastern Mediterranean, and most of the Middle East. Under Demetrius II (r. 239-229 bc), Macedonia was weakened by war with the Greek Achaean and Aetolian leagues. Antigonus III (d. 221) reestablished the Hellenic Alliance, restoring Macedonia to a strong position in Greece. Under Philip V, Macedonia first clashed with Rome, in 215. Philip's defeat upset the old balance of power, and Rome became the decisive force in the eastern Mediterranean. The defeat of his successor, Perseus, at Pydna in 168 bc marked the end of the dynasty.

Antigonus I Monophthalmus \an- , tig-3-n9s...- I man-3f- , thal-m9s\ or Antigonus I Cyclops Latin "One-Eyed" (b. 382 — d. 301 bc,

Phrygia, Asia Minor) Founder of the Macedonian dynasty of the Antigonids. He served as a general under Alexander the Great. From the plots, alliances, and wars among Alexander's successors, he emerged in control of Asia Minor and Syria, though he soon relinquished the lands east of the Euphrates to Seleucus I Nicator. In 307 his son Demetrius I ousted the governor of Athens and conquered Cyprus, giving Antigonus control of the eastern Mediterranean, the Aegean, and Asia Minor. In 306 he was proclaimed king of the empire by the assembled army. In 302 he and his son renewed the Panhellenic League (consisting of all the Hellenic states except Sparta, Messenia, and Thessaly), in order to ensure peace in Hellas and protect Antigonus. His dreams of taking Macedonia itself and Alexander's entire former empire died with him at the Battle of Ipsus (301), the only battle he ever lost.

Antigonus II Gonatas \'gan-ot-3s\ (b. c. 320 — d. 239 bc) King of Macedonia (276-239 bc). The son of Demetrius I Poliorcetes, he defeated the Gauls in Greece (279) and in Asia Minor (277), occupied key cities, and made alliances. He defeated Pyrrhus of Epirus in Greece (272) to

solidify his control in Macedonia. In the Chremonidean War (267-261), he achieved lasting victory over Egypt, Sparta, and Athens. He allied with the Aetolian League and local tyrants to stave off incursions of the Achaean League. His defeat of the Egyptian fleet at Andros (244?) assured Macedonian hegemony in the Aegean.

Antigua and Barbuda \an- , t9-g3...bar- , byu-do\ Island country, Lesser Antilles, Caribbean Sea. It consists of three islands: Antigua, Barbuda, and Redonda. Area: 171 sq mi (442 sq km). Population (2005 est.): 77,800. Capital: St. John's (on Antigua). The majority of the population are descendants of African slaves brought in during colonial times. Language: English (official). Religion: Christianity (mostly Protestant; also Roman Catholic). Currency: Eastern Caribbean dollar. The largest of the islands is Antigua (108 sq mi [280 sq km]), which lacks forests, mountains, and rivers and is subject to droughts. The main anchorage is the deepwater harbour of St. John’s. Barbuda — 25 mi (40 km) north of Antigua, 62 sq mi (161 sq km) in area, and mostly uninhabited — is home to a large bird sanctuary; its only human settlement is Codrington, on the western coast. Redonda, an uninhabited rock (0.5 sq mi [1.3 sq km]), lies southwest of Antigua. Tourism is the mainstay of the country’s economy; offshore banking is growing. Christopher Columbus visited Antigua in 1493 and named it after a church in Sevilla, Spain. It was colonized by English settlers in 1632, who imported African slaves to grow tobacco and sugarcane. Barbuda was colonized by the English in 1678. In 1834 the islands’ slaves were emancipated. Antigua (with Barbuda) was part of the British colony of the Leeward Islands from 1871 until that colony was defederated in 1956. The islands achieved full independence in 1981. See map opposite.

antihistamine V.an-ti-'his-to-.men, .an-ti-'his-to-monV Synthetic drug that counteracts the effects of released histamine in the body. Antihistamines compete with histamine at one of the three types of histamine receptors, preventing allergic attacks (see allergy) or inflammation. Some antihistamines also prevent motion sickness and vertigo. Drowsiness is a frequent side effect. H 2 antihistamines, which bind to the second receptor type, are used to control gastric-acid secretion (see stomach) and treat PEPTIC ULCERS.

Antilles \an-'til-ez\. Greater and Lesser Two groups of islands in the West Indies, bounding the Caribbean Sea on the north and east, respectively. The Greater Antilles include the largest islands (Cuba, Jamaica, Hispaniola, and Puerto Rico), the Lesser Antilles all being much smaller. The name Antilia originally referred to semimythical lands located somewhere west of Europe across the Atlantic. After Christopher Columbus’s

discoveries, the Spanish name Antillas was commonly assigned to the new lands; “Sea of the Antilles” in various European languages is used as an alternative name for the Caribbean Sea.

antimatter Substance composed of elementary particles having the mass and electric charge of ordinary matter (such as electrons and protons) but for which the charge and related magnetic properties are opposite in sign. The existence of antimatter was posited by the electron theory of P.A.M. Dirac. In 1932 the positron (antielectron) was detected in cosmic rays, followed by the antiproton and the antineutron detected through the use of particle accelerators. Positrons, antiprotons, and antineutrons, collectively called antiparticles, are the antiparticles of electrons, protons,

and neutrons, respectively. When matter and antimatter are in close proximity, annihilation occurs within a fraction of a second, releasing large amounts of energy.

antimetabolite N.an-ti-mo-'ta-bo-.lhA Substance that competes with, replaces, or inhibits a specific compound within a CELL, whose functioning is thereby disrupted. Because its structure resembles the compound's, it is taken up by the cell, but it does not react in the same way with the enzyme that acts on the usual compound. It may inhibit the enzyme or be converted into an aberrant chemical. Many antimetabolites are useful in treating disease, including sulfa drugs, which disrupt bacterial but not human metabolism for bacterial diseases, and others (e.g., methotrexate, 5-fluorouracil) for various cancers.

antimony Van-to-.mo-neX Semimetallic to metallic chemical element (see metal), chemical symbol Sb, atomic number 51. Of its various allotropes, the most common is a lustrous, bluish, brittle, flaky solid. In nature

antimony alloys have the rare quality of expanding on solidifying; these are used for castings and for type metal. Alloys with lead are used in car batteries, bullets, and cable sheaths. Antifriction alloys with tin and lead (babbitt metals) are used as components of machine bearings. Antimony compounds (valences 3, 4, and 5) are widely used as flame retardants in paints, plastics, rubber, and textiles; others are used as paint pigments.

anti novel Type of avant-garde novel that departs from traditional novelistic conventions by ignoring such elements as plot, dialogue, and human interest. Seeking to overcome readers' habits and challenge their expectations, antinovelists deliberately avoid any intrusion of authorial personality, preferences, or values. Though the term was coined by Jean-Paul Sartre in 1948, the approach is at least as old as the works of the

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18th-century writer Laurence Sterne. Writers of such works include Nathalie Sarraute, Claude Simon, Alain Robbe-Grillet, Uwe Johnson, and Rayner Heppenstall.

Antioch Van-te-,ak\ Turkish Antakya \,an-ta-'kya\ City (pop., 1997: 139,046), southern Turkey. Founded in 300 bc by the Seleucid dynasty, Antioch was the centre of the Seleucid power until 64 bc, when it became the capital of the province of Syria under the Roman Republic and Empire. An early centre of Christianity, the city was the headquarters of St. Paul c. ad 47-55. Despite being briefly occupied by the Persians in the 6th century, it remained part of the Byzantine Empire until the Arab invasion of the 7th century. Thereafter it returned to Byzantine rule (969) and was

seized by the Turkish Seuuq dynasty (1084) before being captured by the Crusaders in 1098. (See Crusades.) From 1268 it was ruled by the Mam-lOk dynasty, and it was absorbed by the Ottoman Empire in 1517. The city remained under their control until World War I (1914-18), when it was transferred to Syria. It was made part of the Republic of Turkey in 1939. The economy of the modem town is based on agriculture and light manufacturing.

Antiochus I Soter \an-'tI-3-k3s... , so-ter\ (b. c. 324 — d. 261 bc) King of Seleucid Syria in the east (2927-281 bc) and later overall (281-261). Son of Seleucus I, he consolidated the Seleucid kingdom, founded numerous cities, and expanded trade routes. In 281 he contended with revolts in Syria and northern Anatolia and fought a war with Antigonus II Gonatas. With the defeat of the Gauls in Greece (279), he and Antigonus signed a pact of nonintervention. The Gauls in Asia Minor were not defeated until 275, after which he was hailed as Soter (“Saviour”) by appreciative Ionians. He settled Greeks in Asia Minor and Persia to counter invasions, and he worked to revive Babylonian culture. Though he won Phoenicia and the coast of Asia Minor from Egypt, he soon lost them, and in 261 he lost much of northern Asia Minor to Pergamum.

Antiochus III known as Antiochus the Great (b. 242 — d. 187 bc,

near Susa, Iran) Seleucid king of the Syrian empire (223-187 bc). After quelling a rebellion by Achaeus, his governor in Asia Minor (213), Antiochus marched east to India (212—

205). He forged a peaceful alliance with Armenia and forcible ones with Parthia and Bactria, stilling resistance to his campaign. After the death of Ptolemy IV, Antiochus and Philip V of Macedonia divided most of his empire, Antiochus taking the southern and eastern lands, including Palestine (c. 202). He then marched against Egypt, concluding a peace in 195, through which he acquired southern Syria and Ptolemy’s territories in Asia Minor. Rome grew angry with Antiochus after he admitted Hannibal of Carthage to his court; when Antiochus took a force to defend the Aetolians against Rome, Rome struck against him, eventually defeating him at Magnesia (189). He gave up lands in Europe and western Asia Minor but kept Syria, Mesopotamia, and western Iran. He was murdered while exacting much-needed tribute near Susa.

Antiochus IV Epiphanes \i-'pif-3-,nez\ (b. c. 215 — d. 164 bc, Tabae, Iran) Seleucid king of the Hellenistic Syrian kingdom (175-164 bc). Son of Antiochus III, he was taken hostage in Rome (189-175), where he learned about Roman institutions. On his release, he ousted a usurper to take over Syria. He conquered Egypt except Alexandria (169) and ruled Egypt as regent for his nephew Ptolemy VI. The Roman defeat of his Macedonian allies neutralized his victories in Cyprus and Egypt (168), and he was forced to leave both, though he kept southern Syria. He took Jerusalem (167) and enforced its Hellenization; Jewish rites were forbid-

den on pain of death. In 164 Judas Maccabaeus and the anti-Greek Jews conquered Judaea except for the Acra in Jerusalem (164), tore down the altar of Zeus, and reconsecrated the Temple. Antiochus then turned to defending his empire against the Parthians in the east, regained Armenia, and went on to the Arabian coast before dying in Persis.

antioxidant' Any of various compounds added to certain foods, natural and synthetic rubbers, gasolines, and other products to retard autoxidation

(combination with oxygen in the air at room temperature) and its effects. Aromatic compounds such as aromatic amines, phenols, and aminophenols delay loss of elasticity in rubber and gummy deposits in gasoline. Preservatives such as tocopherol (vitamin E), propyl gallate, butylated hydroxytoluene (BHT), and butylated hydroxyanisole (BHA) prevent rancidity in fats, oils, and fatty foods. In the body, antioxidants such as vitamins C and E and selenium may reduce oxidation caused by free radicals.

Antipater \an-'tip-9-tor\ (d. 43 bc) Founder of the Herodian dynasty in Palestine. Bom in Idumaea, a region of southern Judaea, he gained power by helping the Romans, and in return, Julius Caesar appointed him procurator of Judaea in 47 bc. He was assassinated by a rival four years later, but his son, Herod the Great, was made king of Judaea.

Antiphon Van-ti-,fan\ (fl. c. 480-411 bc) Orator and statesman. The first Athenian known to practice rhetoric professionally, he wrote speeches for others to give in court but was reluctant to appear in public debate. He may have instigated the revolution of the oligarchic Council of the Four Hundred, an attempt to seize the Athenian government in the midst of war. When the oligarchy fell, he defended his role in the overthrow in a speech called by Thucydides the greatest defense ever made, but he was nonetheless executed for treason.

anti pope In Roman Catholicism, a person who tries to take the place of the legitimately elected pope. Some antipopes were elected by factions in doctrinal disagreements, and others were chosen in double elections arbitrated by secular authorities or picked as third candidates in an effort to resolve such disputes. The earliest of the antipopes appeared in the 3rd century. During the Investiture Controversy, Henry IV appointed an antipope, and several more antipopes claimed the papal office over the next 200 years as a result of disputed elections or further struggles with secular rulers. The principal age of the antipope came after the papal court was moved from Rome to Avignon in the 14th century (see Avignon papacy), an event that led to the Western Schism of 1378-1417. During this era, the popes now considered canonical were elected in Rome, and the antipopes were elected in Avignon.

Antirent War (1839-46) Civil protest by leaseholding farmers in upper New York state. Protesting outdated laws based on semifeudal leaseholding practices of the early Dutch estate owners, the leaseholders of Albany county in 1 839 refused to pay back rent. The governor called out the militia to quell the violence. Sporadic acts of resistance against rent and tax collection spread across the state, and in 1 845 the governor declared martial law. In 1846 a new state constitution abolished the leasehold system.

antiseptic Any of a variety of agents applied to living tissue to destroy or inhibit growth of infectious microorganisms. An antiseptic’s efficiency depends on concentration, time, and temperature. It is most valuable in

the disinfection of contaminated wounds or skin surfaces when a wide margin exists between the concentration at which it is germicidal and that at which it is toxic to the body's cells. Many antiseptics destroy specific types or forms of microorganisms (e.g., bacteria but not spores). Among the major families of antiseptics are alcohols, phenols, chlorine and iodine compounds, MERCURY-based tinctures, certain acridine dyes, and some essential oils. Antiseptics are distinguished from disinfectants, which are germicidal agents used to destroy microorganisms on inanimate surfaces. See also ANTIBIOTIC.

antitank weapon Any of several guns, missiles, and mines intended for use against tanks. Land mines, ordinary artillery, and other projectiles were used to destroy tanks in World War I. By World War II antitank guns had been developed; they frequently fired special ammunition such as the hollow charge shell, which exploded on impact with great penetrating force. Various antitank missiles and launching devices, including the bazooka, were also used in the war.

antitoxin Antibody formed in the body in reaction to a bacterial toxin, which it can neutralize. People who have recovered from bacterial diseases often develop specific antitoxins that give them immunity against recurrence. Injecting an animal (usually a horse) with increasing doses of toxin produces a high concentration of antitoxin in the blood. The resulting highly concentrated preparation of antitoxins is called an antiserum. The first antitoxin developed (1890) was specific to diphtheria; today, antitoxins are also used to treat botulism, dysentery, gas gangrene, and tetanus.

antitrust law Any law restricting business practices that are considered unfair or monopolistic. Among U.S. laws, the best known is the Sherman Antitrust Act of 1890, which declared illegal "every contract,

Antiochus III, coin, late 3rd-early 2nd century bc; in the British Museum.

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combination. . .or conspiracy in restraint of trade or commerce." The Clayton Antitrust Act of 1914, as amended in 1936 by the Robinson-Patman Act, prohibits discrimination among customers through prices or other means; it also prohibits mergers or acquisitions whenever the effect may be "to substantially lessen competition." Labour unions are also subject to antitrust laws.

antiion Insect (family Myrmeleontidae) known in its larval stage for its aggressive capture of prey. The antlion larva digs a funnel-shaped

sandy pit by using its oval, bristled abdomen, then buries itself in the pit with only its powerful jaws uncovered. Any small insect that ventures over the pit's edge slips to the bottom and is seized by the antiion, which sucks the contents of its victim and throws out the empty skin.

The adult antiion does not feed. The best known of the 65 described species occurs in North America and Europe.

Antofagasta \,an-to-fa-'gas-ta\ Seaport (pop., 1999: est.: 243,038), capital of Antofagasta region, northern Chile. Located on Moreno Bay, it was a Bolivian city until it was taken by Chile in 1879 (see War of the Pacific). Its early growth resulted from the nitrate boom that began in 1866 and from the Caracoles silver discovery in 1 870. The largest city of northern Chile, it remains a supply source for the mines and is a communications centre on the Pan-American Highway.

Antonello da Messina X.an-to-'nel-o-da-ma-'se-noV (b. c. 1430, Messina, Sicily — d. c. Feb. 19, 1479,

Messina) Italian painter. Trained in Naples, then a cosmopolitan art centre, he studied the Flemish artists, notably Jan van Eyck. Based on these experiences, when he returned to Venice he introduced oil painting and Flemish pictorial techniques into mid- 15th-century Venetian art. His major works were altarpieces and portraits. In Venice he executed the San Cassiano altarpiece, of which three fragments remain. His portrait busts in three-quarter view, combining Flemish detail with Italian grandeur, became fashionable.

Antonello' s practice of building form with colour rather than line and shade greatly influenced the subsequent development of Venetian painting. See also Venetian school.

Antonescu V.an-to-'nes-kuN, Ion (b. June 15, 1882, Pitesti, Rom. — d.

June 1, 1946, near Jilava) Romanian marshal. He served in World War I and later became chief of staff (1934) and minister of defense (1937). Appointed prime minister in 1940, he established a fascist dictatorship and openly supported the Axis Powers. Initially he won broad support for his domestic reforms and declaration of war against the Soviet Union (1941), but that support eroded. His regime was overthrown in 1944, and he was later executed as a war criminal.

Antonine Wall Roman frontier barrier in Britain. It ran 37 mi (59 km) across Scotland between the River Clyde and the Firth of Forth. Ordered by Antoninus Pius and built in ad 142 by the governor of Britain, it was about 15 ft (5 m) wide and 10 ft (3 m) high; a ditch 40 ft (12 m) wide and 12 ft (4 m) deep ran in front of it and a road behind. It was controlled by 19 forts spaced at intervals of 2 mi (3 km). Its construction moved the northern boundary of Roman Britain into Scotland, providing defense against the northern tribes beyond Hadrian's Wall, which lay to the south. The wall was abandoned by 196, but traces remain.

Antoninus Pius X.an-to-'nI-nos-'pI-osX in full Caesar Titus Aelius Hadrianus Antoninus Augustus Pius (b. Sept. 19, 86, Lanuvium, Latium — d. March 7, 161, Lorium, Etruria) Roman emperor (ad 138—

"Portrait of a Man," panel painting by Antonello da Messina, c. 1472; in the National Gallery, London.

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161). Of Gallic origins, he served as consul (120) before being assigned judicial administrative duties in Italy. He later governed the province of Asia (c. 134). He became an adviser to Hadrian and in 138 was made Hadrian’s heir. On accession he had the deceased emperor declared a god; for such dutiful acts he was named Pius (“Pious”). He quelled rebellions in Britain and other provinces and built the Antonine Wall.

Antonioni X.an-.to-ne-'O-neN,

Michelangelo (b. Sept. 29, 1912,

Ferrara, Italy) Italian film director and producer. He wrote film reviews and studied filmmaking before directing his short film The People of the Po Valley (1947). His first major film, The Girl Friends (1955), was followed by the international successes L’avventura (1960), Eclipse (1962), and Blow-up (1966). His

other films include The Red Desert (1964), Zabriskie Point (1970), and

The Passenger (1974). In Antonioni's films, plot and dialogue are subordinated to the visual image, which becomes a metaphor of human existence rather than a record of it.

Antoninus Pius, marble bust; in the British Museum.

Antony, Mark Latin Marcus Antonius (b. c. 83 — d. August, 30 bc) Roman general. After military service (57-54), he joined the staff of his relative Julius Caesar. He helped Caesar drive Pompey from Italy in 49 and in 44 was made co-consul. After Caesar's assassination, Octavian (later Caesar Augustus) initially opposed Antony but later formed the Second Triumvirate with Antony and Lepidus. Antony helped defeat republican forces at Philippi and took control of Rome's eastern provinces.

On a mission to Egypt to question Cleopatra about her loyalty, he became her lover (41-40). He returned to Italy in 40 to settle differences with Octavian, whereupon he received command of the eastern provinces. To strengthen his position, he agreed to marry Octavian' s sister Octavia. When relations with Octavian again collapsed, he headed for Syria and sent for Cleopatra for aid. Octavian sent Octavia to him, and, when Antony ordered her back to Rome, a fatal breach opened. The Triumvirate ended in 32, leaving Antony little support in Rome. He divorced Octavia, and Octavian declared war on Cleopatra. Antony lost the Battle of Actium, and he and Cleopatra fled to Egypt, pursued by Octavian. When resistance became futile, they committed suicide.

Antrim Town and district (pop., 2001: 48,366), Northern Ireland. It is also the name of a former Northern Irish county. The town borders Lough Neagh. In 1798 it was the scene of a battle in which several thousand nationalist insurgents led by Henry J. McCracken were defeated by the British. A busy market centre, Antrim town was formerly an important locale for the linen industry. The area has evidence of human inhabitation dating to c. 6000 bc. Anglo-Norman adventurers arrived in the 12th century ad, and the area became part of the earldom of Ulster. The invasion by Edward Bruce from Scotland in 1315 caused the decline of British power. In the 1973 administrative reorganization of Northern Ireland, the county was divided into several districts.

Antwerp French Anvers \a n -'ver\ Flemish Antwerpen \'ant-,ver-p9n\ City (pop., 2000 est.: 446,500), capital of Antwerp province, Belgium. One of the world's major seaports, it is located 55 mi (88 km) southeast of the North Sea. Because it lies in the Flemish-speaking part of Belgium, it plays the role of unofficial capital of Flanders. It

Mark Antony, detail of a marble bust;
in the Vatican Museum.

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received municipal rights in 1291 and became a member of the Hanseatic League by 1315. As a distribution centre for Spanish and Portuguese trade, it became the commercial and financial capital of Europe in the 16th century. Following destructive invasions it went into decline but began to revive after Napoleon’s improvement of the harbour c. 1803. It was part of the Kingdom of the Netherlands (1815-30), then was ceded to Belgian nationalists. Its current economic life centres around shipping, port-related activities, and major manufacturing.

antyesti \ant-'yes-te\ Hindu funeral rites. They generally involve cremation followed by disposal of the ashes in a sacred river. As soon as possible after death, the body is removed to the cremation grounds, usually on the riverbank. The eldest son of the deceased and a priest perform the final rites. For 10 days, the mourners are considered impure as they perform rites intended to provide the soul of the deceased with a new spiritual body for the next life. At a prescribed date, the bones are collected and buried or immersed in a river.

Anu Va-.niA Mesopotamian sky god. He belonged to a triad that included Bel and Ea. Though he was the highest god, his role in mythology, hymns, and cult was small. The father of all gods, evil spirits, and demons, and the god of kings and the calendar, he was depicted with headdress and horns signifying strength. His Sumerian counterpart, An, was originally envisaged as a great bull; he probably began as a god of herders.

Anu Va-.niiV, Chao (b. 1767 — d. 1835, Bangkok, Siam) Ruler of the central Lao kingdom of Vientiane (r. 1804-29). In his youth Anu fought with the Siamese against the Burmans (Burmese) and won Siamese respect for his military prowess. Chosen by them to be king of Vientiane, he undertook major public works and cultivated good relations with Vietnam. He had the Siamese appoint his son ruler of the southern Lao principality of Champassak and began to plot a rebellion for Lao independence. His armies nearly reached Bangkok, but the revolt was quelled and Vientiane was sacked and later razed. Anu fled to the forests but was captured, punished, and killed.

Anubis Xo-'nii-bosX Ancient Egyptian god of the dead, represented as a jackal or as a man with the head of a jackal. In the Early Dynastic period and the Old Kingdom he was preeminent as lord of the dead, but he was

later overshadowed by Osiris. Anubis was associated with the care of the dead and was credited with the invention of embalming, an art he first practiced on the corpse of Osiris. Later assigned the role of conducting souls into the underworld, he was sometimes identified in the Greco-Roman world with Hermes.

Anuradhapura Xo-'nur-o-ds-.pur-oV (c. 3rd century Bc-10th century ad) Sinhalese kingdom centred at Anuradhapura in Sri Lanka. Though plagued by invasions from southern India (which took actual control of the kingdom several times) and internal strife among warring clans, the kingdom of Anuradhapura developed a high degree of culture. Its complex irrigation system is often considered its major achievement. The modern city of Anuradhapura (pop. 2001 prelim.: 56,632) contains vast Buddhist ruins and a bo tree grown from a slip of the tree under which the historical Buddha is said to have reached Enlightenment.

Anvers See Antwerp

anvil Iron block on which metal is placed for shaping, originally by hand with a hammer. The blacksmith’s anvil is usually of wrought iron (sometimes of cast iron), with a smooth working surface of hardened steel. A projecting conical beak, or horn, at one end is used for hammering curved pieces of metal. When power hammers are used, the anvil is supported on a heavy block, which in turn rests on a strong foundation of timber and masonry or concrete. See also smithing.

anxiety In psychology, a feeling of dread, fear, or apprehension, often with no clear justification. Anxiety differs from true fear in that it is typically the product of subjective, internal emotional states rather than a response to a clear and actual danger. It is marked by physiological signs such as sweating, tension, and increased pulse, by doubt concerning the reality and nature of the perceived threat, and by self-doubt about one’s capacity to cope with it. Some anxiety inevitably arises in the course of daily life and is normal; but persistent, intense, chronic, or recurring anxiety not justified by real-life stresses is usually regarded as a sign of an emotional disorder. See also stress.

Anzio \'ant-se-,6\ Seaport and resort town (pop., 2001 prelim.: 36,468) southeast of Rome, Italy. It was founded, according to legend, by Anteias, son of Odysseus and Circe. It was a stronghold of the Volsci in the 5th century bc. Conquered by Rome in 338 bc, Antium (as it was then known) became a resort for wealthy Romans. Nero and Caligula were born there. Destroyed by the Saracens in the 9th- 10th centuries, it remained virtually deserted until 1698, when Pope Innocent XII built a new port nearby. In 1944 it was the scene of a bloody but successful amphibious landing by Allied forces during World War II.

ANZUS Pact officially Pacific Security Treaty Security pact for the South Pacific, signed in 1951 by Australia, New Zealand, and the U.S. (hence its acronym). The U.S. first suggested a pact to Australia in the wake of the U.S. -Japan Security Treaty and fears of Japanese rearmament. The signatories agreed to maintain a consultative relationship for their collective security. In the 1980s New Zealand refused to let ships carrying nuclear weapons dock at its ports; the U.S., refusing to identify its nuclear-armed ships, suspended its treaty obligations to New Zealand in 1986, and the treaty has since been nonoperative with reference to New

Zealand.

aorta Artery that carries blood from the heart to all the organs and structures of the body. Where the left ventricle opens into the aorta, a valve prevents backflow of blood into the heart. The aorta ascends from the heart, arches over it to the left, then descends into the trunk. Arteries branch off along its length until it divides at hip level into arteries that go to the legs.

aorta, coarctation of the Congenital disorder involving narrowing of a short section of the aorta’s arch over the heart. It causes a characteristic murmur, abnormally high blood pressure in the arms, and reduced blood flow to the abdomen, pelvis, and legs. It increases the workload of the left ventricle, which usually becomes enlarged. Surgical reconstruction or replacement (depending on the person’s age) of the narrowed area is most effective in the young.

Aosta \a-'os-ta\ City (pop., 2001: 33,926), capital of Valle d ' Aosta region, northwestern Italy. Located at the juncture of the Great and Little St. Bernard Pass roads through the Alps, it was a stronghold of the Salassi, a Celtic tribe subdued by the Romans in 25 bc. A Roman town was founded there by Augustus in 24 bc, and many Roman structures survive, including the walls, two gates, and a triumphal arch in honour of Augustus. Aosta was the birthplace of St. Anselm.

AP See Associated Press

Apache North American Indians of the southwestern U.S. Their name is a Zuni word meaning “enemy.” Most Apaches live on five reservations in Arizona and New Mexico, U.S. Culturally, the Apache are divided into Eastern Apache, which include the Mescalero, Jicarilla, Chiricahua, and

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Apamea Cibotus > aphorism I 87

Lipan, and Western Apache, which include the Cibecue. The Eastern Apache were predominantly hunting and gathering societies, while their Western counterparts relied more on farming. Their ancestors had come down from the north, as is evident from their languages; Apachean languages are distantly related to other Athabascan languages spoken in Canada. They settled the Plains, but with the introduction of the horse they were pressed south and west by the Comanche and Ute. They attempted to befriend the Spanish, the Mexicans, and later the U.S. In 1861, however, there began a quarter-century confrontation between U.S. military forces and the Apache and Navajo. The Apache wars were among the fiercest fought on the frontier. The last ended in 1886 with the surrender of Geronimo. The Chiricahua Apache were evacuated from the West and held successively in Florida, Alabama, and Oklahoma. In the 2000 U.S. census some 57,000 people claimed sole Apache descent. See also Cochise.

Apamea Cibotus X.a-po-'me-o-si-'bo-tosX City of Hellenistic Phrygia, near modern Dinar, Turkey. The city was built by Antiochus I (Antiochus Soter) in the 3rd century bc on the Maeander (Menderes) River. Superseding the fortress city of Celaenae, it was placed in a commanding position on the great east-west trade route of the Seleucid dynasty. In the 2nd century bc Apamea passed to the rule of the Roman Republic and Empire and became an important centre for Italian and Jewish traders. Declining after the 3rd century ad, it was captured by Turkish invaders in 1070 and thereafter was destroyed by an earthquake.

apartheid \9-'par-,tat\ (Afrikaans: “apartness” or “separateness”) Policy of racial segregation and political and economic discrimination against non-European groups in South Africa. The term was first used as the name of the official policy of the National Party in 1948, though racial segregation, sanctioned by law, was already widely practiced. The Group Areas Act of 1950 established residential and business sectors in urban areas for each “race” and strengthened the existing “pass” laws, which required non whites to carry identification papers. Other laws forbade most social contacts between those of European descent and others, authorized segregated public facilities, established separate educational standards, restricted each group to certain types of jobs, curtailed nonwhite labour unions, denied nonwhite participation in the national government, and established various black African “homelands,” partly self-governing units that were nevertheless politically and economically dependent on South Africa. These so-called homelands were not recognized by international governments. Apartheid was always subject to internal criticism and led to many violent protests, strikes, and acts of sabotage; it also received international censure. In 1990-91 most apartheid legislation was repealed, but segregation continued on a de facto basis. In 1993 a new constitution enfranchised blacks and other racial groups, and all-race national elections in 1994 produced a coalition government with a black majority. These developments marked the end of legislated apartheid, though not of its entrenched social and economic effects. See also African National Congress; racism.

apatite A member of the phosphate group of minerals, the world’s major source of phosphorus, found as variously coloured, glassy crystals, masses, or nodules. Much of it has a chemical composition approximating Ca 5 (P0 4) 3 (F,Cl,OH). If not for its softness, apatite would be a popular gemstone; some of the material found is clear, but it is fragile and difficult to cut and polish.

Apatosaurus Vo-.pa-to-'sor-osX Genus of giant herbivorous dinosaur, one of the largest land animals of all time. Apatosaurus lived between 147 million and 137 million years ago during the Late Jurassic and Early Cretaceous Periods in North America and Europe. It weighed as much as 30 tons and was as long as 70 ft (21 m), including the very long neck and tail. Formerly known as Brontosaurus because of incomplete fossil evidence, its head was depicted until 1978 as massive and snub-nosed, with spoonlike teeth; scientists now know the animal had a slender, elongated skull and long, peglike teeth. Skeletal evidence indicates that, despite their great bulk, apatosaurs were primarily land animals.

ape Any of the tailless primates known as the lesser apes (gibbons and siamangs; family Hylobatidae) or the great apes (chimpanzees, bonobos, orangutans, and gorillas; family Hominidae). Apes are found in the tropical forests of western and central Africa and South Asia. They are distin-

guished from monkeys by having no tail, having an appendix, and having a more complex brain. Apes typically move about by swinging or knuckle-walking, though they are capable of standing erect and occasionally walk

on two feet. Highly intelligent animals, apes are very closely related to humans, who are also categorized by zoologists as members of Hominidae. As a result of habitat destruction and hunting, all the apes are now regarded as endangered.

APEC in full Asia-Pacific Economic Cooperation Trade group established in 1989 in response to the growing interdependence of Asia-Pacific economies and the advent of regional economic blocs (such as the European Union and the North American Free Trade Area) in other parts of the world. APEC works to raise living standards and education levels through sustainable economic growth and to foster a sense of community and an appreciation of shared interests among Asia-Pacific countries. At the end of the 1990s APEC’s membership included its 12 founding members — Australia, Brunei, Canada, Indonesia, Japan, South Korea, Malaysia, New Zealand, the Philippines, Singapore, Thailand, and the United States — as well as Chile, China, Hong Kong, Mexico, Papua New Guinea, Peru, Russia, Taiwan, and Vietnam. The Pacific Economic Cooperation Council, the South Pacific Forum, and the secretariat of the Association of Southeast Asian Nations maintain observer status. The APEC group represents about 40% of the world’s population, 40% of global trade, and 50% of the world’s gross national product. See also NAFTA; trade agreement; World Trade Organization.

a pel la \9-'pe-b\ Ancient Spartan assembly, similar to the Ecclesia of other Greek states. The apella, whose monthly meetings were open to citizens over age 30, did not initiate proposals. It could only consider matters submitted by the ephors or the gerousia. Voting was by shouts. Its business included treaties, wars, and succession; it named commanders, elected elders and ephors, and voted on changes in the laws.

Apelles \3-'pe-,lez\ (fl. late 4th century-early 3rd century bc) Greek painter. He studied under Pamphilus and was court painter to Philip II of Macedonia and his son, Alexander the Great. Notable works included a portrait of Alexander, an allegorical picture of Calumny, and a painting of Aphrodite rising from the sea. A master of composition and chiaroscuro, he was noted for his technical improvements; he used a dark glaze to preserve his paintings and soften their colour. Though no copies of his works survive, in antiquity he was considered the greatest of Greek painters.

Apennines Va-p3-,nlnz\ Mountain range, central Italy. It stretches some 840 mi (1,350 km) from near Savona in the northwest to Reggio di Calabria in the south, its width varying from 25 to 80 mi (40-130 km). Monte Corno is its highest peak, at 9,560 ft (2,915 m). The range is the source of most of Italy’s rivers, including the Arno, Tiber, Voltumo, and Garigliano. It is famous for its hill towns, including Florence, Arezzo, L'Aquila, and Benevento.

Apgar Score System Rating procedure to identify newborns needing life-sustaining medical assistance. It was developed in 1952 by Virginia Apgar (1909-1974). Five signs, keyed to Apgar’ s name — Appearance (color), Pulse, Grimace (reflex irritability), Activity (muscle tone), and Respiration — measure adaptation to leaving the uterus. The maximum score is 10. If the total score at one and then five minutes after

birth is less than 7, the infant is reevaluated every five minutes for 20 minutes or until two consecutive scores of 7 or more are obtained.

aphasia \9-'fa-zho\ or dysphasia \dis-'fa-zho\ Defect in the expression and comprehension of words, caused by damage to the frontal and temporal lobes of the brain. It can result from head trauma, tumour, stroke, or infection. Symptoms vary with the brain area involved, and the ability to put words in a meaningful order may be lost. Speech therapy may be useful. In some cases, improvement may be due to assumption of some language functions by other areas of the brain.

aphid Va-fsd', a-fod\ Any of several species of sapsucking, soft-bodied insects (order Homoptera) that are about the size of a pinhead, with tube-like projections on the abdomen. Serious plant pests, they stunt plant growth, produce plant galls, transmit plant viral diseases, and deform leaves, buds, and flowers. Ants may take care of aphids, protecting them from weather and natural enemies and transferring them from wilted to healthy plants. The ants in turn obtain honeydew, a sweet product excreted by aphids, which the ants retrieve by “milking” the aphids (stroking their abdomens).

aphorism Terse formulation of any generally accepted truth or sentiment conveyed in a pithy, memorable statement. The term was first used in the Aphorisms of Hippocrates, a long series of propositions concerning disease and the art of healing. Aphorisms were used especially in dealing

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with subjects for which principles and methodology developed relatively late, including art, agriculture, medicine, jurisprudence, and politics, but in the modem era they have usually been vehicles of wit and pithy wisdom. Celebrated modern aphorists include Friedrich Nietzsche and Oscar Wilde.

aphrodisiac X.a-fro-'de-ze-.akA Any of various forms of stimulation thought to arouse sexual excitement. They may be psychophysiological (arousing the senses of sight, touch, smell, or hearing) or internal (e.g., foods, alcoholic drinks, drugs, love potions, medicinal preparations). Most foods traditionally believed to be aphrodisiacs have no chemical components that would have such an effect. In some cases, their reputation may be based on a supposed resemblance to genitalia (e.g., ginseng root, rhinoceros horn). Drugs such as alcohol or marijuana may lead to sexual excitation by lessening the user’s inhibitions. Few medical studies have been conducted; the only substances medically recognized as aphrodisiacs are extremely hazardous to the health.

Aphrodite \,a-fr3-'dl-te\ Greek goddess of sexual love and beauty. She is also associated with the sea and, according to legend, was born of sea foam arising from the genitals of Uranus. Sparta, Thebes, and Cyprus honored her as a goddess of war. Many scholars believe that her cult is

Semitic rather than Greek in origin. According to Homer, she was the daughter of Zeus and his consort Dione, and she married Hephaestus but betrayed him with Ares. She had many mortal lovers. Her main centres of worship were on the islands of Cyprus and Cythera and at Corinth. As a fertility goddess, she is associated with Eros, the Graces, and the Horae (seasons). Venus is her Roman counterpart.

Apia \a-'pe-a\ Seaport town (pop., 2001: 38,836) and capital, Samoa. It lies on the northern coast of Upolu Island. Its economy centres on the export of goods to American Samoa. Robert Louis Stevenson is buried at nearby Mount Vaea; Vailima, his former home, is now the residence of the head of state.

apiculture See beekeeping

Apis \'a-p3s\ In ancient Egyptian religion, a sacred bull deity worshiped at Memphis. The cult originated at least as early as the 1st dynasty (c.

2925-c. 2775 bc). Apis was probably at first a fertility god but became associated with Ptah and also with Osiris and Sokaris, gods of the dead.

When an Apis bull died, it was buried with great pomp, and the calf that was to be its successor was installed at Memphis. Apis's priests drew omens from the bull's behaviour, and his oracle had a wide reputation. The worship of Serapis (a combination of Osiris and Apis) probably arose at Memphis in the 3rd century bc and became one of the most widespread Oriental cults in the Roman Empire.

aplastic \a-'plas-tik\ anemia or anemia of bone-marrow failure Inadequate blood-cell formation by bone marrow. Pancytopenia is the lack of all blood-cell types (ERYTHROCYTES, LEUKOCYTES, and PLATELETS), but any combination may be missing. Drug, chemical, or radiation exposure most often causes the disease, but about half of all cases have no known cause. It may occur at any age. Acute disease may be quickly severe, even fatal; chronic disease has symptoms including weakness, shortness of breath, headache, fever, and pounding heart. There is usually a waxy pallor. Hemorrhages occur in mucous membranes, skin, and other organs. Lack of white blood cells lowers resistance to infection and becomes the major cause of death. Very low platelet count may lead to severe bleeding. The treatment of choice is bone-marrow transplantation. Otherwise treatment involves avoiding any known toxic agent and giving fluids, glucose, and proteins (often intravenously) as well as blood components and antibiotics.

aplite or haplite Any igneous rock of simple composition, such as granite composed only of alkali feldspar, muscovite mica, and quartz; in

a more restricted sense, uniformly fine-grained (less than 0.08 in., or 2 mm), light-coloured igneous rocks that have a characteristic granular texture. Unlike pegmatite, which is similar but much coarser-grained, aplite occurs in small bodies that rarely contain zones of different minerals. The two rocks may occur together and are assumed to have formed at the same time from similar magmas.

Apo \'a-po\, Mt. Active volcano, Mindanao, Philippines. Located west of Davao City, it is the highest point in the Philippines, at 9,690 ft (2,954 m). In 1939 its slopes and immediate vicinity were incorporated into Mount Apo National Park, which includes numerous peaks and valleys as well as Malasita Falls and Sibulao Lake.

apocalypse Vo-'pa-ko-.lipsV In many Western religious traditions, the period of catastrophic upheaval expected to occur just before the end of the world, when God will come to sit in judgment on humankind. The belief that the world will come to a violent and cataclysmic end exists in Judaism and Christianity as well as in Zoroastrianism. Several of the prophetic works of the Hebrew Scriptures, notably the book of Daniel, include visions of the apocalypse. The book of Revelation (or Apocalypse) gives a dark and dramatic picture of the end of time, when the wicked will be punished and the good will triumph through God’s intervention. The approach of the Last Days is expected to be marked by famines, wars, earthquakes, plagues, and other natural disasters, along with signs in the heavens. Today apocalyptic themes are emphasized by various religious groups (e.g., fundamentalist Christians) and have also been taken up by science-fiction writers. See also eschatology; millennialism.

Apocrypha Vo-'pa-kro-foV In biblical literature, works outside an accepted canon of scripture. In modern usage the Apocrypha refers to ancient Jewish books that are not part of the Hebrew Bible but are considered canonical in Roman Catholicism and Eastern Orthodoxy. Among the various books included are Tobit, Judith, Baruch, and the Maccabees as well as Ecclesiasticus and the Wisdom of Solomon. Protestant churches follow Jewish tradition in judging these works apocryphal or noncanonical. The term deuterocanonical is used to refer to works accepted in one canon but not all. Pseudepigrapha are spurious works for which biblical authorship is claimed.

Apollinaire \a-p6-le-'ner\, Guillaume orig. Guillelmus (or Wilhelm) Apollinaris de Kostrowitzky (b. Aug. 26, 1880,

Rome?, Italy — d. Nov. 9, 1918,

Paris, Fr.) French poet of Polish-Italian birth. Arriving in Paris at age 20, Apollinaire always kept his early years obscure. In his short life he took part in all the avant-garde movements that flourished at the beginning of the 20th century. His poetry was characterized by daring, even outrageous, technical experiments. Because of his efforts to create an effect of surprise by means of unusual verbal associations and

word patterns, he is often considered the herald of Surrealism. His poetic masterpiece was Alcools (1913). His death resulted from a head wound received in World War I.

Apollo Most widely revered of the Greek gods. He communicated the will of his father Zeus, made humans aware of their guilt and purified them of it, presided over religious and civil law, and foretold the future. His bow symbolized distance, death, terror, and awe; his lyre symbolized music, poetry, and dance. As a patron of the arts, he was often associated with the Muses. He was also a god of crops and herds. He became associated with the sun, and was even identified with Helios, the sun god. Also associated with healing, he was the father of Asclepius. By tradition, Apollo and his twin, Artemis, were born at Delos to Leto. Apollo’s oracle was established at Delphi; the Pythian Games commemorated his killing (while still an infant) of the serpent Python to take the shrine. His many lovers fared poorly: the fleeing Daphne became a laurel tree; the unfaithful Coronis was shot by Artemis, and Cassandra, who rejected him, was doomed to utter true prophecies no one would believe. See photograph opposite page.

Apis, bull deity, painted on the bottom of a wooden coffin, c. 700 bc; in the Roemer und Pelizaeus Museum, Hildesheim, Ger.

BAVARIA VERLAG

Apollinaire, drawing by Pablo Picasso from the frontispiece to Calligrammes, 1918

H. ROGER-VIOLLET

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Apollo NASA manned Moon-landing project of the 1960s and ’70s. The Apollo spacecraft, supplied with their own low-powered rockets, could brake on approach to the Moon and go into lunar orbit. They also could release part of the spacecraft, the lunar module, with its own rocket power, to land astronauts on the Moon and bring them back to the lunar orbiter. In July 1969 Apollo 11 made the first lunar landing (see Edwin Aldrin; Neil Armstrong). In 1970 Apollo 13 was damaged by an explosion in an oxygen tank but returned safely to Earth. Later Apollo missions explored the lunar surface extensively, collecting samples of Moon rocks and installing instruments for research. Apollo 17, the program’s final lunar

flight, took place in 1972. In total, 12 American astronauts walked on the Moon during six successful lunar-landing missions.

Apollo asteroid See Earth-crossing asteroid

Apollo Theatre During and after the Harlem Renaissance, a centre of African-American popular music on 125th Street in New York City's Harlem district. Built in 1914, it hosted musical performers such as Bill Robinson, Billie Holiday, Bessie Smith, Ethel Waters, Duke Ellington, and others in the 1930s and '40s; stars such as Ella Fitzgerald, Sarah Vaughan, and James Brown were discovered on Wednesday amateur nights. In the 1960s the Apollo featured soul artists such as the Supremes, Stevie Wonder, and Marvin Gaye. Converted into a movie theatre in 1975, it was reopened as a performance venue in 1983.

Apollonius Dyscolos V.ap-o-'lo-ne-os-'dis-ko-losV (fl. 2nd century ad) Greek grammarian. Apollonius is considered the founder of the systematic study of grammar. Priscian based his work on the writings of Apollonius. Four of Apollonius's works survive: On Syntax and the shorter treatises On Pronouns , On Conjunctions, and On Adverbs.

Apollonius of Perga (b. c. 240 bc, Perga, Anatolia — d. c. 190 bc, Alexandria, Egypt) Mathematician known as "The Great Geometer." His Conics was one of the greatest scientific treatises of the ancient world. In it he introduced the terms parabola, ellipse, and hyperbola. Because Conics was fundamental to later advances in optics and astronomy in the Islamic world, a 9th-century Arabic translation survived to fill in for some of the missing Greek original. Generally, his other writings survive only as titles.

Apollonius of Rhodes (b. c. 295 bc) Greek poet and grammarian. He served as librarian of the famous Library of Alexandria. His Argonautica, a romantic epic in four books about the Argonauts, is derived from Homer and is noted for its suggestive similes, vivid descriptions of nature, and fresh handling of old episodes.

apologetics Branch of Christian theology devoted to the intellectual defense of faith. In Protestantism, apologetics is distinguished from polemics, the defense of a particular sect. In Roman Catholicism, apologetics

refers to the defense of the whole of Catholic teaching. Apologetics has traditionally argued positively to quell believers' doubts and negatively against opposing beliefs to remove obstacles to conversion. It attempts to take objections to Christianity seriously without giving ground to skepticism. Biblical apologetics defended Christianity as the culmination of Judaism, with Jesus as the Messiah. In the 2nd and 3rd centuries a number of Christian writers defended the faith against the criticisms of Greco-Roman culture, and in the 5th century St. Augustine wrote his monumental City of God as a response to further criticisms of

Christianity following the sack of Rome in 410. John Calvin's "natural theology" attempted to establish religious truths by rational argument. The late 18th-century argument that a universe exhibiting design must have a designer continues to be used; apologists have also dealt with the challenges of Darwinism, Marxism, and psychoanalysis. See also Apologist.

Apologist Any of the Christian writers, primarily in the 2nd century, who attempted to provide a defense of Christianity against Greco-Roman culture. Many of their writings were addressed to Roman emperors and were submitted to government secretaries in order to defend Christian beliefs and practices. The Apologists tried to prove the antiquity of Christianity as the fulfillment of Old Testament prophecy, and they argued that the worshipers of the mythological gods were truly godless. They also insisted on the philosophical nature of their faith and its high ethical standards. Greek Apologists include Justin Martyr and Clement of Alexandria. Latin Apologists of the 2nd century include Tertullian. See also apologetics.

apology In literature, an autobiographical form in which a defense is the framework for discussion of the author's personal beliefs. Examples include Plato's Apology (4th century bc), in which Socrates answers his accusers by giving a history of his life and moral commitment, and John Henry Newman's Apologia pro Vita Sua (1864), an examination of the principles that inspired his conversion to Roman Catholicism.

apomixis \ l a-p3-'mik-s9s\ Reproduction by special tissues without fertilization. Examples include parthenogenesis in animals (in which a new individual develops from an unfertilized egg) and apogamy in plants (in which the generating tissue may be either the gametophyte or the sporophyte). Apomixis provides for the preservation of traits favourable to individual survival, but it eliminates the longer-term evolutionary advantage of genetic contribution from two parents.

apoptosis X.a-pop-'to-sosV or programmed cell death Mechanism that allows cells to self-destruct when stimulated by the appropriate trigger. It may be initiated when a cell is no longer needed, when a cell becomes a threat to the organism's health, or for other reasons. The aberrant inhibition or initiation of apoptosis contributes to many disease processes, including cancer. Though embryologists had long been familiar with the process of programmed cell death, not until 1972 was the mechanism's broader significance recognized. Apoptosis is distinguished from necrosis, a form of cell death that results from injury.

Apostle Any of the 12 disciples chosen by Jesus. They were Peter, James and John (sons of Zebedee), Andrew, Philip, Bartholomew, Matthew, Thomas, James (son of Alphaeus), Thaddaeus or Judas (son of James), Simon the Cananaean or Zealot, and Judas Iscariot. The 12 were privileged to attend Jesus continually and receive his teaching. Peter, James, and John formed an inner circle and were allowed to witness such events as the Transfiguration and the agony of Jesus at Gethsemane. After the defection and death of Judas Iscariot, Matthias was elected an Apostle. Paul also claimed the title on the ground that he had seen the Lord and been commissioned by him.

Apostolic succession V.a-po-'sta-likN In Christianity, the doctrine that bishops represent an uninterrupted line of descent from the Apostles of Jesus. This succession gives bishops special powers, including the right to confirm church members, ordain priests, consecrate bishops, and rule over the clergy and church members of a diocese. Clement, bishop of Rome, stated the doctrine as early as ad 95, and it is accepted by Roman Catholic, Eastern Orthodox, Old Catholic, and several other churches. Some Protestant churches maintain that succession is spiritual and doctrinal rather than ritual and historical.

apotheosis Vo-.pa-the-'o-sosX Elevation to the status of a god. The term recognizes that some individuals cross the dividing line between human and divine. Ancient Greek religion was disposed to belief in heroes and demigods, and historical figures were sometimes worshiped as gods. Until the end of the republic the Romans accepted only one apotheosis, identifying the god Quirinus with Romulus. The emperor Augustus ordered Julius Caesar recognized as a god and thus began a tradition of deifying emperors.

apotropaic eye V.a-po-tro-'pa-ikN Painting of a large eye or eyes used to ward off evil. The symbol appears most commonly on Greek drinking vessels from the 6th century bc and was perhaps thought to keep dangerous spirits from entering the mouth with the wine. It is also used in Turkish and Egyptian art.

Appalachian Geosyncline Great downbuckle in the Earth’s crust in the region of the present Appalachian Mountains. It was in the Appalachians that James Hall first worked out the geosynclinal theory of mountain building (see geosyncune).

Apollo Belvedere, restored Roman copy of the Greek original attributed to Leochares, 4th century bc; in the Vatican Museum, Rome

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Appalachian Mountains Mountain system, eastern North America. The Appalachians, among the oldest mountains on Earth, extend almost 2,000 mi (3,200 km) from the Canadian province of Newfoundland and Labrador in the northeast southwestward to Alabama in the U.S. They include the White Mountains in New Hampshire, the Green Mountains in Vermont, the Catskill Mountains in New York, the Allegheny Mountains primarily in Pennsylvania, the Blue Ridge Mountains in Virginia and North Carolina, the Great Smoky Mountains in North Carolina and Tennessee,

and the Cumberland Plateau extending from West Virginia to Alabama. Their highest peak is Mount Mitchell in North Carolina. See also Appalachian Geosyncune; Appalachian National Scenic Trail.

Appalachian National Scenic Trail Footpath, Appalachian Mountains, U.S. Extending over 2,000 mi (3,200 km) from Mount Katahdin, Maine, to Springer Mountain, Georgia, along the crest of the mountains, the trail passes through 14 states, 8 national forests, and 2 national parks. Hikers and volunteers maintain the shelters and campsites. The trail's highest point is Clingmans Dome (6,643 ft [2,025 m]) in the Great Smoky Mountains. With its first section opened in 1923, the trail was completed in 1937 and became part of the National Trail System established by the U.S. Congress in 1968.

Appalachian orogenic \,6r-9-'je-nik\ belt Mountain range that extends more than 1,860 mi (3,000 km) along the eastern margin of North America, from Alabama to Newfoundland. It was formed by the progressive eastward addition of material to the continental margin of North America. The earliest Appalachian sediments were deposited near the start of the Cambrian Period.

Appalachian Revolution See Alleghenian orogeny

Appaloosa Colour breed of horse popular in the U.S. It is said to have descended in the Nez Perce Indian territory of North America from wild mustangs, which in turn descended from the horses of Spanish explorers.

Appaloosas have several distinctive colour patterns and all the regular coat colours of horses. They stand 14-16 hands (about 56-64 in. [142-163 cm]) tall and weigh 1,000-1,100 lbs (450-500 kg). Though light, they are also sturdy.

appanage Va-po-nij\ In France, primarily from the 13th to the 16th century, the giving of lands or pensions to children of the royal family.

Established to provide for the younger brothers and sisters of the king, appanages also helped develop royal administration within the lands concerned. The Ordinance of Moulins (1566) made royal lands inalienable, so all appanages would eventually revert to the crown. They were abolished during the French Revolution but were briefly reestablished between 1810 and 1832.

appeal Resort to a higher court to review the decision of a lower court, or to any court to review the order of an administrative agency. Its scope is usually limited. In the U.S., the higher court reviews only matters in the record of the original trial; no new evidence can be presented. The Supreme Court of the United States hears appellate cases that it regards as having important implications; otherwise, appeals generally stop with the United States Courts of Appeals. See also certiorari.

appeasement Foreign policy of pacifying an aggrieved nation through

negotiation in order to prevent war. The prime example is Britain's policy toward Fascist Italy and Nazi Germany in the 1930s. Neville Chamberlain sought to accommodate Italy's invasion of Ethiopia in 1935 and took no action when Germany absorbed Austria in 1938. When Adolf Hitler prepared to annex ethnically German portions of Czechoslovakia, Chamberlain negotiated the notorious Munich Agreement.

Appel \'a-pel\, Karel (b. April 25, 1921, Amsterdam, Neth.) Dutch painter, sculptor, and graphic artist. He attended Amsterdam's Royal Academy of Fine Arts (1940-43) and was cofounder of the COBRA group of northern European Expressionists. In 1950 he moved to Paris; by the 1960s he had settled in New York City. An exponent of expressive abstraction, he developed a painting style characterized by thick layering of pigment, violent colour and brushwork, and crude, reductive figures. His

figurative sculptures are executed in metal and wood. He painted portraits of jazz musicians and a number of public works, including a mural in the Paris UNESCO building.

appendix in full vermiform appendix Vestigial hollow tube attached to the cecum of the large intestine. The human appendix, usually 3-4 in. (8-10 cm) long and less than 0.5 in. (1.3 cm) wide, has no digestive function. Its muscular walls expel their own mucous secretions or any intestinal contents that enter it. Blockage of the opening may prevent expulsion and cause appendicitis; fluids collect, bacteria propagate, and the appendix becomes distended and inflamed; tissue in the appendix begins to die, and the organ may burst, causing peritonitis. Its symptoms may begin with moderate pain in the upper abdomen, about the navel, or all over the abdomen. Nausea and vomiting may then develop. The pain may shift to the right lower abdomen. Fever is usually present but is seldom high in the early phases. Differentiating acute appendicitis from other causes of abdominal pain requires careful examination. Treatment is removal of the appendix (appendectomy).

Appian Way Va-pe-on\ Latin Via Appia. First and most famous of the ancient Roman roads, running from Rome to Campania and southern Italy. Begun in 312 bc by the censor Appius Claudius Caecus, the road originally ran 132 mi (212 km) to ancient Capua; by 244 bc it extended 230 mi (370 km) to the port of Brundisium (Brindisi) in Italy's heel. Built of smoothly fitted blocks of lava on a heavy stone foundation, the road provided a long-lasting surface for transporting merchandise to these seaports (and thence by ship to Greece and the eastern Mediterranean). Remains can be seen today outside Rome.

apple Fruit of the genus Malus, in the rose family, the most widely cultivated tree fruit. Malus species are native to the temperate zones of both hemispheres. They require a considerable period of dormancy, well-drained soil, careful pruning in early years of growth, and a rigorous pest-management program for mature trees. The apple is one of the pome (fleshy) fruits. Apples at harvest vary widely in size, shape, colour, and acidity, but most are fairly round and some shade of red or yellow. The thousands of varieties fall into three broad classes: cider, cooking, and dessert varieties. Varieties that ripen in late summer generally do not store well, but those that ripen in late autumn may be stored for as long as a year. The largest producers of apples are the U.S., China, France, Italy, and Turkey. Eaten fresh or cooked in various ways, apples provide vitamins A and C, carbohydrates, and fibre.

Apple Computer, Inc. Microcomputer design and manufacturing company, the first successful personal-computer company. It was founded in 1976 by Steven P. Jobs and Stephen G. Wozniak, whose first computer was manufactured in the Jobs family's garage. The Apple II (1977), with its plastic case and colour graphics, launched the company to success, earning Apple over $100 million by 1980, the year the company first offered stock to the public. The 1981 introduction of IBM's PC, running a Microsoft Corp. operating system, marked the beginning of long-term competition for Apple in the personal-computer market. The Macintosh, introduced in 1984, was the first personal computer to use a graphical user interface and a mouse. The "Mac" initially sold poorly, and Jobs left the company in 1985, but eventually it found its niche in the desktop publishing market. Meanwhile, Microsoft's Windows operating system eroded Apple's market share. Apple recalled Jobs in 1997. He returned the company to profitability by introducing more innovative products, such as the iMac. Apple introduced iTunes, software for playing music that has been converted to the MP3 format, and the iPod portable MP3 music player in 2001; in 2003 the company began selling downloadable copies of major record company songs in MP3 format over the Internet.

apple scab Disease of apple trees caused by the fungus Venturia inaequalis , producing dark blotches or lesions on the leaves, fruit, and sometimes young twigs. Affected plants may drop their fruit prematurely, resulting in potentially high crop losses. Apple scab is found wherever apples are grown but is most severe where spring and summer are cool and moist. All apple species are affected. Regular spraying with fungicides is the most effective method of controlling the disease.

Appleseed, Johnny orig. John Chapman (b. Sept. 26, 1774, Leominster, Mass. — d. March 18?, 1845, near Ft. Wayne, Ind., U.S.) U.S. pioneer and folk hero. He was trained as a nurseryman and began c. 1800 collecting apple seeds from cider presses in Pennsylvania. He then traveled west to the Ohio River valley, planting apple seeds along the way. He tended 1,200 acres of his own orchards and was responsible for hun-

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Appaloosa

SALLY ANNE THOMPSON

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dreds of square miles of others, having sold or given away thousands of apple seedlings to pioneers. His kind and generous nature, devout spirituality, affinity for the Indians and the wilderness, and eccentric appear-

ance (including bare feet, a coffee-sack shirt, and a mush pan for a hat) helped make him a figure of legend.

applied psychology Branch of psychology concerned with solving practical problems of human behaviour by using the findings and methods of psychological science. Intelligence testing, legal problems, industrial efficiency, motivation, and delinquency were among the first areas of application in the early 20th century. World Wars I and II fostered work on vocational testing, teaching methods, evaluation of attitudes and morale, performance under stress, propaganda and psychological warfare, and rehabilitation. The aviation and aerospace industries were important for the development of engineering psychology, the study of human-machine relationships. Other areas include consumer psychology, school psychology, and community psychology. See also industrial-organizational psychology; psychometrics.

applique See quilting

Appomattox \,a-p3-'ma-t3ks\ Court House Former town, southern central Virginia, U.S., site of the surrender of Robert E. Lee to Ulysses S. Grant on April 9, 1865, effectively ending the American Civil War. It was virtually deserted after the removal of the county seat to the new town of Appomattox in 1892. It became a national historical monument in 1940 and a national historical park in 1954.

apprenticeship Training in an art, trade, or craft under a legal agreement defining the relationship between master and learner and the duration and conditions of their relationship. Known from antiquity, apprenticeship became prominent in medieval Europe with the emergence of the craft guilds. The standard apprenticeship lasted seven years. During the Industrial Revolution a new kind of apprenticeship developed in which the employer was the factory owner and the apprentice, after a period of training, became a factory worker. The increasing need for semiskilled workers led to the development of vocational and technical schools in Europe and the U.S., especially after World War II. Some industries in the U.S., such as construction, continue to employ workers in an apprenticeship arrangement.

approximation, linear See linear approximation

APRA Va-pra\ in full Alianza Popular Revolucionaria Americana Party founded by Victor Raul Haya de ia Torre (1924), which dominated Peruvian politics for decades. Largely synonymous with the so-called Aprista movement, it was dedicated to Latin American unity, the nationalization of foreign-owned enterprises, and an end to the exploitation of Indians. Supported by workers and middle-class liberals, the party wielded significant power, but conservative forces took extraordinary measures to prevent Haya de la Torre from ever gaining the presidency. An APRA candidate, Alan Garcia, finally became president in 1985. See also indigenismo.

apraxia \a-'prak-se-o\ Disturbance in carrying out skilled acts, caused by a lesion in the cerebral cortex; motor power and mental capacity remain intact. Motor apraxia is the inability to perform fine motor acts. Ideational apraxia is loss of the ability to plan even a simple action. In ideokinetic apraxia, there is no coordination between formation of ideas and motor activity; affected persons can do certain things automatically but not deliberately. Constructional apraxia is the inability to put together elements to

form a meaningful whole.

apricot Fruit of the tree Prunus armeniaca, in the rose family, cultivated generally throughout the temperate regions of the world and used fresh, cooked in pastries, or preserved by canning or drying. Apricot trees are large and spreading, with heart-shaped, dark green leaves. Flowers are white. The fruit is nearly smooth and generally similar to the peach in shape but with little to no hairiness when ripe. Apricots are a good source of vitamin A and are high in natural sugars. Dried apricots are an excellent source of iron.

April Fools' Day or All Fools' Day First day of April, named for the custom of playing practical jokes on that date. Though it has been observed for centuries in several countries, including France and Britain, its origin is unknown. It resembles the Hilaria festival of ancient Rome (March 25) and the Hou festival of India (ending March 31). The custom of playing April Fools’ jokes was brought to America by the British.

April Theses Program developed by Vladimir Ilich Lenin during the Russian Revolution of 1917, calling for Soviet control of state power. In the theses, published in April 1917, Lenin advocated seizing power from the Provisional Government, withdrawing from World War I, and distributing land among the peasantry. The theses contributed to the July Days uprising and the Bolshevik coup d’etat in October.

apse Semicircular or polygonal termination to the choir, chancel (see cathedral), or aisle of a public building, first used in pre-Christian Roman architecture. Originally a large niche to hold the statue of a deity in a temple, the apse also appeared in ancient baths and basilicas. The domed apse became a standard part of the Christian church plan.

Apuleius \,a-p9-la-3sV Lucius (b.

c. ad 124, Madauros, Numidia — d. after 170?) Roman Platonic philosopher, rhetorician, and author. His The Golden Ass, a prose narrative of the ribald adventures of a young man who is changed into an ass, was long influential. This novel, considered a revelation of ancient manners, is valuable for its description of the ancient religious mysteries.

Apuleius ’s philosophical treatises include three books on Piato, two of which survive.

Apulia See Puglia

Apure \a-'pii-ra\ River River, western Venezuela. The major navi-

gable tributary of the Orinoco River, the Apure rises in the Cordillera de Merida and flows about 510 mi (820 km) northeast and east through the heart of Venezuela's Llanos (plains), the country's principal cattle-raising area.

Apurimac V.a-pur-'e-.makX River River, southern Peru. Arising in the Andes Mountains in Peru, it is the most distant source of the Amazon River. It flows northwest to join the Urubamba River and form the Ucayali River. For most of its 430-mi (700-km) length, it flows through narrow canyons, and its course is interrupted by falls and rapids. Short stretches of its lower course are also called the Ene River and the Tambo River.

Aqa Khan See Aga Khan

Aqaba Va-ko-boV Gulf of Northeastern arm of the Red Sea, between Saudi Arabia and the Sinai Peninsula. It varies in width from 12 to 17 miles (19 to 27 km) and is 100 miles (160 km) long. Its head touches Egypt, Israel, Jordan, and Saudi Arabia. Its only sheltered harbour is Dhahab (Dahab), Egypt; Jordan and Israel created the ports of Al-'Aqabah and Elat, respectively, as outlets to the Red Sea and the Indian Ocean.

Aqhat Epic Va-kat\ Ancient West Semitic legend explaining the earth's barrenness during the dry summer months, known only in fragmentary form from three tablets excavated in northern Syria and dating to about the 14th century bc. It records the birth of a prince, Aqhat, in response to prayers. As a youth, Aqhat comes into possession of a bow intended for the goddess Anath and is killed by her when he refuses to part with it. His death brings famine, and his father and sister set out to avenge him, but there the text ends.

Aqmola See Astana

aquaculture or fish farming or mariculture Vmar-o-.kol-chorX Rearing of fish, shellfish, and some aquatic plants to supplement the natural supply. Fish are reared in controlled conditions worldwide. Though most aquaculture supplies the commercial food market, many governmental agencies engage in it to stock lakes and rivers for sport fishing. It also supplies goldfish and other decorative fish for home aquariums and bait fish for sport and commercial fishing. Carp, trout, catfish, tilapia, scallops, mussels, lobsters, and oysters are well-known species raised through aquaculture.

Apse, basilica of S. Vitale, Ravenna, 526-547

AUNARI— ART RESOURCE

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aquamarine Pale greenish blue or bluish green variety of beryl that is valued as a gemstone. The most common variety of gem beryl, it occurs in pegmatites, in which it forms much larger and clearer crystals than emerald, the dark green variety of beryl. Aquamarine occurs in Brazil, which is the chief source, and in such other sites as the Ural Mountains, Madagascar, Sri Lanka, India, and Maine, New Hampshire, Connecticut, North Carolina, and Colorado in the U.S. Heat treatment is commonly used to improve the colour of gem beryls.

aquarium Receptacle for maintaining aquatic organisms, either freshwater or marine, or a facility in which a collection of aquatic organisms is displayed or studied. The first display aquarium opened in Regent's Park, England, in 1853. Many of the world's principal cities now have public aquariums as well as commercial ones; other aquarium facilities serve chiefly as research institutions. Regardless of size — whether a small one-gallon jar or a huge million-gallon tank — aquariums must be constructed with care; many substances, especially plastics and adhesives, that are nontoxic to humans are toxic to water-breathing animals. The primary requirement for maintaining aquatic organisms is water quality.

Aquarius (Latin: "Water carrier") In astronomy, the constellation lying between Capricorn and Pisces; in astrology, the 11th sign of the zodiac, governing approximately the period January 20-February 18. It is usually represented as a man pouring a stream of water out of a jug, probably because in ancient times the rising of Aquarius coincided in the Middle East with the annual arrival of floods or rainfall. In the astrological concept called the Great Year — the 25,000-year period it takes the earth to pass through the influence of the entire zodiac — the early 19th century was the beginning of the Age of Aquarius.

aquatint Method of etching that produces finely granulated tonal areas rather than lines, so that finished prints often resemble watercolour or wash drawings. A copper plate is exposed to acid through a layer of granulated resin or sugar, which yields a finely speckled gray tone when the plate is inked and printed. The texture and depth of tone are controlled by the strength of the acid baths and the length of time the plate is exposed to them. Aquatint became the most popular method of producing toned prints in the late 18th century; its most notable practitioner was Francisco Goya. In the 19th century Edgar Degas and Camille Pissarro experimented with it, and in the 20th century the sugar aquatint was employed by Pablo Picasso, Georges Rouault, and Andre Masson.

aquavit \'a-kw9-,vet\ (from Latin aqua vitae , "water of life") Scandinavian clear distilled liquor flavoured with caraway seeds. Distilled from a fermented potato or grain mash, filtered with charcoal, and usually bottled without aging, aquavit has an alcohol content of 42^15% by volume. Most aquavits are sweet and spicy. It is usually served chilled and unmixed, in small glasses.

aqueduct Conduit built to carry water from its source to a main distribution point. Ancient Rome's aqueduct system, an extraordinary feat of engineering, brought water to the city from as far as 57 mi (92 km) away. Only a portion of the Roman aqueducts utilized the familiar stone arch; most were underground conduits made of stone or terra-cotta pipe. Modern aqueduct systems employ cast iron or steel. See also water-supply system.

aquifer Va-kws-fsA In hydrology, a rock layer or sequence that contains water and releases it in appreciable amounts. The rocks contain water-filled pores that, when connected, allow water to flow through their matrix. A confined aquifer is overlain by a rock layer that does not transmit water in any appreciable amount or that is impermeable. There probably are few truly confined aquifers. In an unconfined aquifer the upper surface (water table) is open to the atmosphere through permeable overlying material. An aquifer also may be called a water-bearing stratum, lens, or zone.

Aquinas Vo-'kwI-nosV Saint Thomas (b. 1224/25, Roccasecca, near Aquino, Terra di Lavoro, Kingdom of Sicily — d. March 7, 1274, Fossanova, near Terracina, Latium, Papal States; canonized July 18, 1323; feast day January 28, formerly March 7) Foremost philosopher and theologian of the Roman Catholic church. Born of noble parents, he studied at the University of Naples, joined the Dominicans, and taught at a Dominican school at the University of Paris. His time in Paris coincided with the arrival of Aristotelian science, newly discovered in Arabic translation; his great achievement was to integrate into Christian thought the rigours of Aristotle’s philosophy, just as the early Church Fathers had integrated Plato’s thought in the early Christian era. He held that reason is capable of

operating within faith; while the philosopher relies solely on reason, the theologian accepts faith as his starting point and then proceeds to conclusion through the use of reason. This point of view was controversial, as was his belief in the religious value of nature, for which he argued that to detract from the perfection of creation was to detract from the creator. He was opposed by St. Bonaventure. In 1277, after his death, the masters of Paris condemned 219 propositions, 12 of them Thomas’s. He was nevertheless named a Doctor of the Church in 1567 and declared the champion of orthodoxy during the modernist crisis at the end of the 19th century. A prolific writer, he produced more than 80 works, including Summa contra Gentiles (1261—64) and Summa theologica (1265-73). See also Thomism.

Aquino \9-'ke-no\, (Maria) Corazon orig. Maria Corazon Cojuangco (b. Jan. 25, 1933, Manila, Phil.) President of the Philippines (1986-92). Born into a politically prominent family, she married Benigno Simeon Aquino, Jr. (1932-83), who became the most prominent opponent of Pres. Ferdinand Marcos. Benigno was assassinated in 1983 on his return from exile, and Corazon became the opposition candidate for president in 1986. Though Marcos was officially reported the winner, there were widespread allegations of voting fraud; high officials in the military supported Aquino, and Marcos fled. As president, Aquino introduced a hugely popular constitution. Over time her popularity declined amid charges of corruption and economic injustice.

Aquitaine Historical region, southwestern France. It was roughly equivalent to Aquitania, the Roman division of southwestern Gaul, which consisted of the area between the Pyrenees Mountains and the Garonne River. Conquered by Clovis in ad 507, it was later made a subkingdom by Charlemagne in the 8th century. After the Carolingian decline, it became a powerful duchy, which by the 10th century controlled much of France south of the Loire. It passed to the Capetian line when Eleanor of Aquitaine married Louis VII (1137); on her second marriage, to Henry II of England (1152), it passed to the English Plantagenets. The name Guyenne, a corruption of Aquitaine, came into use in the 10th century, and the subse-

quent history of Aquitaine is merged with that of Gascony and Guyenne.

AR-1 5 See Ml 6 rifle

Ara Pads Va-ra-'pa-sis\ (Augustae) Latin "Augustan Altar of Peace" State monument built by Caesar Augustus in Rome's Campus Martius (13-9 bc) to commemorate his victorious return from Spain and Gaul. It consists of an altar on a podium enclosed by walls. Its lavish sculptural decoration is among the finest examples of Roman art; reliefs representing the ceremonial procession at the altar's dedication are the first in Western art that can strictly be called documentary, showing identifiable individuals in a contemporary event.

Arab Any member of the ARABic-speaking peoples native to the Middle East and North Africa. Before the spread of Islam in the 630s, the term referred to the largely nomadic Semitic peoples of the Arabian Peninsula; it came to apply to Arabic-speaking peoples from Africa's Mauritanian and Moroccan coasts east to Iraq and the Arabian Peninsula and south to The Sudan after their acceptance of Islam. Traditionally, some Arabs are desert-dwelling pastoral nomads (see Bedouin), whereas others live by oases and in small, isolated farming villages. While most Arabs are Muslims, some are Christian. The term has also been used in a political sense by Arab nationalists to describe a greater sociolinguistic or ethnic ideal ("the Arab nation"). See also Pan-Arabism.

Arab-lsraeli wars Series of military conflicts fought between various Arab countries and Israel (1948—49, 1956, 1967, 1969-70, 1973, and 1982). The first war (1948-49) began when Israel declared itself an independent state following the United Nations' partition of Palestine. Protesting this move, five Arab countries — Egypt, Iraq, Jordan, Lebanon, and Syria — attacked Israel. The conflict ended with Israel gaining considerable territory. The 1956 Suez Crisis began after Egypt nationalized the Suez Canal. A French, British, and Israeli coalition attacked Egypt and occupied the canal zone but soon withdrew under international pressure. In the Six-Day War of 1967, Israel attacked Egypt, Jordan, and Syria. The war ended with the Israel occupying substantial amounts of Arab territory. An undeclared war of attrition (1969-70) was fought between Egypt and Israel along the Suez Canal and ended with the help of international diplomacy. Egypt and Syria attacked Israel in 1973 (the Yom Kippur War), but, despite early Ar ab success, the conflict ended inconclusively. In 1979 Egypt made peace with Israel. In 1982 Israel invaded Lebanon in order to expel Palestinian guerrillas based there. Israel withdrew from most of Lebanon by 1985 but maintained a narrow buffer zone inside that country until 2000. See also Yasir 'Arafat; Hafiz al-Assad; Menachem Begin; David Ben-Gurion; Camp David Accords; Moshe Dayan; Hezbollah; Gamal Abdel Nasser; Yitzhak Rabin; Sabra and Shatila massacres; Anwar el-Sadat.

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Arab League or League of Arab States Regional organization

formed in 1945 and based in Cairo. It initially comprised Egypt, Syria, Lebanon, Iraq, Transjordan (now Jordan), Saudi Arabia, and Yemen; joining later were Libya, Sudan, Tunisia, Morocco, Kuwait, Algeria, Bahrain, Oman, Qatar, the United Arab Emirates, Mauritania, Somalia, the Palestine Liberation Organization, Djibouti, and Comoros. The league's original aims were to strengthen and coordinate political, cultural, economic, and social programs and to mediate disputes; a later aim was to coordinate military defense. Members have often split on political issues; Egypt was suspended for 10 years (1979-89) following its peace with Israel, and the Persian Gulf War (1990-91) also caused deep rifts. See also Pan-Arabism.

arabesque Style of decoration characterized by interlacing plant forms and abstract curvilinear motifs. It is typical of Islamic ornamentation from c. 1000. The word was first used in the 15th or 16th century when Europeans became interested in the Islamic arts, but the motif itself was derived from Hellenistic craftsmen in Asia Minor. Arabesques were also applied to the decoration of illuminated manuscripts, walls, furniture, metalwork, pottery, stonework, majolica, and tapestry from the Renaissance to the 19th century.

Arabia See Arabian Peninsula

Arabian Desert Desert region,

Arabian Peninsula. It covers about 900,000 sq mi (2,330,000 sq km), occupying nearly the entire peninsula. It lies largely within Saudi Arabia but large portions extend into Jordan, Iraq, Kuwait, Qatar, the United Arab Emirates, Oman, and Yemen. Its relief is broken by a number of mountain ranges, with elevations reaching as high as 12,000 ft (3,700 m), and it is bounded on three sides by high escarpments. At least one-third of the desert is covered by sand, including the Rub' al- Khali, considered to have one of the most inhospitable climates on Earth. There are no perennial bodies of water, though the Tigris- Euphrates river system lies to the northeast and the Wadi Hajr is located to the south, in Yemen. Humans have inhabited the area since Pleistocene times.

Arabian horse Earliest improved breed of horse, valued for its speed, stamina, beauty, intelligence, and gentleness. Its long history has been obscured by legend, but it was developed in Arabia by the 7th century ad. It has contributed its qualities to most modern breeds of light horses. It is compact and relatively small, with a small head, protruding eyes, wide nostrils, marked withers, and a short back. Its average height is about 15 hands (60 in. [152 cm]), its average weight 800-1,000 lbs (360-450 kg). Though many colours are possible, gray is the most common.

Arabian Nights' Entertainment See The Thousand and One Nights

Arabian Peninsula or Arabia Peninsular region, southwest Asia. With its offshore islands, it covers about 1 million sq mi (2.6 million sq km). Constituent countries are Bahrain, Kuwait, Oman, Qatar, United Arab Emirates, Yemen, and, the largest, Saudi Arabia. It is generally arid and is covered almost entirely by the Arabian Desert. The modem economy is dominated by the production of petroleum and natural gas. The world's largest proven reserves of those minerals are in the Arabian Peninsula. Its political consolidation was begun by the Prophet Muhammad, and it was the centre of the orthodox caliphate until 661, when that office passed to the Umayyad dynasty in Damascus. After 1517 much of the region was dominated by the Ottoman Empire, though the peninsula's people, who had remained largely tribal and nomadic, revolted repeatedly until the World War I (1914-18), when the Ottoman Empire dissolved. Thereafter, individual nation-states followed their own histories, though many maintained close ties with European powers such as the United Kingdom.

Arabian religions, ancient Polytheistic religions of Arabia prior to the rise of Islam. Most of the deities of the Arab tribes were sky gods, associated with heavenly bodies such as the Sun and Moon, and they had the power to ensure fecundity, protection, or revenge. At the head of the southern Arabian pantheon was 'Athtar, a god of thunderstorms and rain. Each kingdom also had a national deity, of whom the nation called itself the progeny. Sanctuaries were carved in rock on high places and held a baetyl ("raised stone") or statue of the god in an open-air enclosure, accessible only to ritually clean persons. In northern Arabia they included a walled enclosure with a covered or enclosed altar, similar to the Muslim Ka'bah. Libations, animal sacrifices, and other offerings were made to the gods, and priests interpreted oracles and performed divination. Worshipers made yearly pilgrimages to important shrines, participating in rites that included purification, the wearing of ritual clothing, sexual abstinence, abstention from shedding blood, and circuits performed around the sacred object.

Arabian Sea Northwestern part of the Indian Ocean, lying between India and the Arabian Peninsula. It has an area of about 1 ,49 1 ,000 sq miles (3,862,000 sq km) and an average depth of 8,970 feet (2,734 m). The Gulf of Oman connects it with the Persian Gulf via the Strait of Hormuz, while the Gulf of Aden connects it with the Red Sea via the Strait of Mandeb. The Indus is the principal river draining into the Arabian Sea. Socotra, Lakshadweep, and other islands lie within it. Chief ports are Mumbai (Bombay), India; Karachi, Pak.; and Aden, Yemen. The sea has been part of the principal trade route between Europe and India for centuries.

Arabic alphabet Script used to write Arabic and a number of other languages whose speakers have been influenced by Arab and Islamic culture. The 28-character Arabic alphabet developed from a script used to write Nabataean Aramaic. Because Arabic had different consonants than Aramaic, diacritical dots came to be used to eliminate ambiguous readings of some letters, and these remain a feature of the script. Arabic is written from right to left. The letters denote only consonants, though the symbols for w, y, and (historically) the glottal stop do double duty as vowel letters for long u, i, and a. Additional diacritics, representing short vowels (or the lack thereof), case endings, and geminate (duplicate) consonants, are normally employed only for the text of the Qur'an, for primers, or in instances where the reading might otherwise be ambiguous. Because Arabic script is fundamentally cursive, most letters have slightly different forms depending on whether they occur in the beginning, middle,

or end of a word. Non-Semitic languages for which some version of the Arabic alphabet has been or is used include Persian, Kurdish, Pashto, Urdu, some Turkic languages, Malay, Swahili, and Hausa. The Maltese language is the only form of Arabic to be written in the Latin alphabet.

Arabic language Ancient Semitic language whose dialects are spoken throughout the Middle East and North Africa. Though Arabic words and proper names are found in Aramaic inscriptions, abundant documentation of the language begins only with the rise of Islam, whose main texts are written in Arabic. Grammarians from the 8th century on codified it into the form known as Classical Arabic, a literary and scribal argot that differed markedly from the spoken vernacular. In the 19th-20th centuries, expansion of Classical Arabic's stylistic range and vocabulary led to the creation of Modern Standard Arabic, which serves as a lingua franca among contemporary Arabs. However, Arabic speakers, who number roughly 200 million, use an enormous range of dialects, which at their furthest extremes are mutually unintelligible. Classical Arabic remains an important cultural and religious artifact among the non- Arab Islamic community. See also Arabic alphabet.

Arabic literary renaissance (19th-century) Movement to develop a modern Arabic literature. Inspired by contacts with the West and a renewed interest in classical Arabic literature, it began in Egypt with Syrian and Lebanese writers who sought the freer environment there, and it spread to other Arab countries as a result of the dismemberment of the Ottoman Empire after World War I and the coming of independence after World War II. Its success in altering the direction of Arabic literature is related to the spread and modernization of education and the emergence of an Arabic press.

Arabic philosophy or Islamic philosophy Doctrines of the Arabic philosophers of the 9th-12th century who influenced medieval Scholasticism in Europe. The Arabic tradition combines Aristotelianism and Neoplatonism with other ideas introduced through Islam. Influential thinkers include the Persians al-KiNDi, al-FARABi, and Avicenna, as well as the

Arabesque decoration on the dome of the Madar-i-Shah madrasah ("school") built by Husayn I, early 1 8th century, at Esfahan, Iran

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Spaniard Averroes, whose interpretations of Aristotle were taken up by both Jewish and Christian thinkers. Muslims, Christians, and Jews par-

ticipated in the Arabic tradition and separated themselves according to philosophic rather than religious doctrines. When the Arabs dominated Spain, the Arabic philosophic literature was translated into Hebrew and Latin; this contributed to the development of modern European philosophy. In Egypt around the same time, the Arabic tradition was developed by Moses Maimonides and Ibn Khaldun.

Arachne \o-'rak-ne\ In Greek mythology, the daughter of the dyer Idmon of Colophon. She was a weaver who acquired such skill that she ventured to challenge Athena to a contest. Athena wove a tapestry showing the gods in majesty, while Arachne depicted them in their amorous adventures. Enraged at the perfection of her rival’s work, Athena tore it to shreds, whereupon Arachne hanged herself. Out of pity Athena loosened the rope, which became a cobweb, and Arachne was changed into a spider.

arachnid \o-'rak-nid\ Any member of the class Arachnida, primarily carnivorous arthropods having a well-developed head, a hard external skeleton, and four pairs of walking legs. Spiders and scorpions have a segmented body, but daddy longlegs, ticks, and mites do not. Arachnids range in size from tiny mites (0.003 in. [0.08 mm] long) to the 8-in. (21 -cm) black scorpion of Africa. As arachnids grow, they molt several times (see molting). Most are unable to digest food internally; instead, they inject their prey with digestive fluids and suck the liquefied remains. Arachnids are found worldwide in nearly every habitat. Most groups are free-living, but some mites and ticks are parasitic and can carry serious diseases of animals and humans. Venomous spiders and scorpions also may pose a danger to humans. However, most arachnids are harmless and prey on insect pests.

Arachosia X.ar-o-'ko-zhoV Ancient province, eastern Persian empire. The province encompassed much of what is now southern Afghanistan in the area of the city of Kandahar. It was conquered by Alexander the Great c. 330 bc.

‘Arafat \,ar-9-'fat\, Yasir orig. Muhammad ‘Abd al-Ra’uf al-Qudwah al-Husaynl (b. August 1*929 — d. Nov. 11, 2004, Paris, France) Palestinian leader. The date and place of his birth are disputed. A birth certificate registered in Cairo, Egypt, gives Aug. 24, 1929, but some sources support his claim to have been born in Jerusalem on Aug. 4, 1929. He graduated from the University of Cairo as a civil engineer and served in the Egyptian army during the 1956 Suez Crisis. That year, working as an engineer in Kuwait, he cofounded the guerrilla organization Fatah, which became the leading military component of the Palestine Liberation Organization (PLO), which he led from 1969. In 1974 the PLO was formally recognized by the UN, and 'Arafat became the first leader of a nongovernmental organization to address the UN. In 1988 he acknowledged Israel’s right to exist, and in 1993 he formally recognized Israel during direct talks regarding land controlled by Israel since the Six-Day War. In 1994 he shared the Nobel Prize for Peace with Israelis Yitzhak Rabin and Shimon Peres. In 1996 he became president of the new Palestinian Authority.

Aragon \'ar-9-,gan\ Spanish Aragon Autonomous community (pop., 2001: 1,204,215), northeastern Spain. Roughly coextensive with the historical kingdom of Aragon, it occupies an area of 18,425 sq mi (47,720 sq km). Its capital is Zaragoza (Saragossa). Mountains, including the Pyrenees, dominate the relief north and south of the Ebro River, which bisects Aragon. Established in 1035 by Ramiro I, the historical kingdom

grew as land was retaken from the Moors: Zaragoza, the capital of the Almoravid kingdom, fell to Alfonso I of Aragon in 1118, and the reconquest of present-day Aragon was completed by the late 12th century. In the 1 3th– 15th centuries it came to rule Sicily, Sardinia, Naples, and Navarra. In the 15th century Ferdinand married Isabella of Castile, uniting the kingdoms of Aragon and Castile and forming the nucleus of modern Spain. The old kingdom of Aragon survived as an administrative unit until 1833, when it was divided into provinces. Agriculture, mining, and industry, the latter concentrated at Zaragoza, are economically important.

Aragon \a-ra-'go n \, Louis orig. Louis Andrieux (b. Oct. 3, 1897, Paris, Fr. — d. Dec. 24, 1982, Paris) French poet, novelist, and essayist. He was introduced by Andre Breton into avant-garde circles, and the two cofounded the Surrealist review Litterature in 1919. From 1927 he was increasingly a political activist and spokesman for communism, which resulted in a break with the Surrealists. Among his works are the novel tetralogy Le Monde reel, 4 vol. (1933-44), describing the class struggle

of the proletariat; the huge novel Les Communistes, 6 vol. (1949-51); novels of veiled autobiography; and volumes of poems expressing patriotism and love for his wife. He was editor of the communist weekly of arts and literature, Les Lettres frangaises, 1953-72.

aragonite Vs-'rag-o-.nlA A carbonate mineral, the stable form of calcium carbonate (CaC0 3) at high pressures. It is somewhat harder and has a slightly higher specific gravity than calcite. Aragonite is found in recent deposits formed at low temperatures near the surface of the earth, as in caves as stalactites, with ore minerals, in serpentine and other basic (see acid and basic rocks) rocks, and in sediments. Aragonite is the mineral normally found in pearls, and it occurs in some animal shells. It is polymorphous (same chemical formula but different crystal structure) with calcite and vaterite, and, with geologic time, changes to calcite even under normal conditions.

Araguaia \,ar-9-'gwI-9\ River River, central Brazil. Rising in the Brazilian highlands, it flows north some 1,600 mi (2,600 km) to join the Tocantins River at Sao Joao do Araguaia. In midcourse it divides into channels on either side of Bananal Island, which is about 200 mi (320 km) long and the site of the National Park of Araguaia. Though the river drains a vast area of interior Brazil, it offers poor transportation because of its many falls.

arahant See arhat

Arai Hakuseki \a-ri-ha-ku-'sa-ke\ (b. March 24, 1657, Edo [Tokyo], Japan — d. June 29, 1725, Edo) Japanese scholar of Confucianism and government official of the mid-ToKUGAWA period. Arai was tutor and later adviser to Tokugawa Ienobu, the sixth Tokugawa shogun. He wrote on such subjects as Japanese geography, philosophy, and legal institutions and is considered one of Japan’s greatest historians. Among his best-known works are Tokushi yoron, a history of Japan, and Koshitsu, a study of early document sources. See also Genroku period; Edo culture.

Arakcheyev \a-r9k-'cha-yif\, Aleksey (Andreyevich), Count

(b. Oct. 4, 1769, Novgorod province, Russia— d. May 3, 1834, Gruzino, Novgorod province) Russian soldier and statesman. Appointed inspector

general of artillery in 1803, he reorganized that branch of the army, then served as minister of war (1808-10). In the Russo-Swedish War of 1 808–09, he personally compelled the reluctant Russian forces to cross the frozen Gulf of Finland to attack the Aland Islands, which ultimately resulted in Sweden’s cession of Finland to Russia. He was Alexander I’s chief military adviser in the Napoleonic Wars. After the wars, he supervised the management of Russia’s domestic matters with brutal and ruthless efficiency, which caused the period (1815-25) to be known as Arakcheyevshchina, but also took part in the emancipation of serfs in the Baltic provinces and created a system of military-agricultural colonies.

Araks River See Aras River

Aral Sea Large salt lake between Kazakhstan and Uzbekistan. It once covered some 26,300 sq mi (68,000 sq km) and was the fourth largest inland body of water in the world, but diversion of the waters of the Syr Darya and Amu Darya rivers for irrigation has led to an overall reduction of its surface area by more than half since 1960. Its volume has been reduced drastically, which has led to an increase in salinity. The soil of the dried-up lake bed has been found to contain salts and other toxic substances.

Aram \'ar-9m\ Ancient country, Middle East, southwestern Asia. It extended eastward from the Anti-Lebanon Mountains to beyond the Euphrates River. It was named for the Aramaeans, who emerged from the Syrian desert to invade Syria and Upper Mesopotamia (c. 1 1th century bc) and who built numerous city-kingdoms, including Damascus. It lends its name to the Aramaic language.

Aramaean N.ar-s-'me-anX A member of any people belonging to a confederacy of tribes that migrated from the Arabian Peninsula to the Fertile Crescent c. 1500-1200 bc. Among them were the biblical matriarchs Leah and Rachel, wives of Jacob. The Aramaic language and culture spread through international trade. They reached a cultural peak during the 9th-8th centuries bc. By 500 bc, Aramaic had become the universal language of commerce, culture, and government throughout the Fertile Crescent and remained so through the time of Jesus and into the 7th century in some areas.

Aramaic \,ar-9-'ma-ik\ language Semitic language originally spoken by the ancient Aramaeans. The earliest Aramaic texts are inscriptions in

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an alphabet of Phoenician origin found in the northern Levant dating from c. 850 to 600 bc. The period 600-200 bc saw a dramatic expansion of Aramaic, leading to the development of a standard form known as Imperial Aramaic. In later centuries, as “Standard Literary Aramaic,” it became a linguistic model. Late (or Classical) Aramaic (c. ad 200-1200) has an abundant literature, both in Syriac and in Mandaic (see Mandaeanism). With the rise of Islam, Arabic rapidly supplanted Aramaic as a vernacu-

lar in South Asia. Modern Aramaic (Neo-Aramaic) comprises West Neo-Aramaic, spoken in three villages northeast of Damascus, Syria, and East Neo-Aramaic, a group of languages spoken in scattered settlements of Jews and Christians in southeastern Turkey, northern Iraq, and northwestern Iran, and by modern Mandaeans in the Shatt Al-'Arab. Since c. 1900 persecution has forced most contemporary East Neo-Aramaic-speakers, who number several hundred thousand, into diaspora communities around the world.

Aramco \3-'ram-ko\ in full Arabian American Oil Company Oil

company founded by the Standard Oil Co. of California (Chevron) in 1933, when the government of Saudi Arabia granted it a concession. Other U.S. companies joined after oil was found near Dhahran in 1938. In 1950 Aramco opened a pipeline from Saudi Arabia to the Mediterranean Sea port of Sidon, Leb. It was closed in 1983 except to supply a refinery in Jordan. A more successful pipeline, with a destination on the Persian Gulf, was finished in 1981. In 1951 Aramco found the first offshore oil field in the Middle East. In the 1970s and ’80s, control gradually passed to the Saudi Arabian government, which eventually took over Aramco and renamed it Saudi Aramco in 1988.

Aran Islands \'ar-an\ Islands (pop., 2001: 543), Galway Bay, western Ireland. The group of small islands, totaling about 18 sq mi (47 sq km), includes Inishmore (or Aranmore), Inishmaan, and Inisheer. Their main town is Kilronan on Inishmore. The islands contain impressive prehistoric and early Christian forts. Novelist Liam O' Flaherty was born on Inishmore.

Arany \6r-'on y \ Janos (b. March 2, 1817, Nagyszalonta, Hung. — d. Oct. 22, 1882, Budapest) Hungarian epic poet. His main work is the trilogy of Toldi (1847), Toldi szerelme (1848-79), and Toldi esteje (1854). Recounting the adventures of a 14th-century youth of great physical strength, it was received with enthusiasm by a public craving a national literature of quality in a language all could grasp. Other notable works include a fragment of an epic poem, Bolond Istok (1850), and The Death of King Buda (1864), the first part of a projected Hun trilogy. The Oszikek, written just before his death, poignantly reflects his sense of unfulfillment and isolation. He is considered Hungary’s greatest epic poet.

arap Moi, Daniel See Daniel arap Moi

Arapaho \3-'ra-p3-,ho\ North American Plains Indian peoples living mostly in Oklahoma and Wyoming, U.S. They are believed to have once lived in permanent villages in the eastern woodlands. Their language is of Algonquian stock. Like other Plains groups, the Arapaho were nomadic, living in tepees and depending on the buffalo for subsistence. They split into northern and southern groups after 1830. They were highly religious and practiced the sun dance. Their social organization included age-graded military societies as well as men’s shamanistic societies. They traded with the Mandan and Arikara and were often at war with the Shoshone, Ute, and Pawnee. A southern branch was long allied with the Cheyenne and fought with them against Col. George Custer at Little Bighorn in 1876. In the 2000 U.S. census some 7,000 people claimed sole Arapahoe descent.

Ararat Var-o-.ratX, Mount Turkish Agri Dagi Extinct volcanic massif, eastern Turkey. Located in Agri province, near the Iranian border,

Ararat has two peaks, Great Ararat, at 16,853 ft (5,137 m) the highest point of elevation in Turkey, and Little Ararat, almost 13,000 ft (4,000 m). Ararat is traditionally associated with the mountain where Noah's ark came to rest at the end of the biblical Deluge. A village on its slopes at the site where Noah is said to have built an altar was destroyed in an earthquake in 1840.

Aras \a-'ras\ River or Araks \a-'raks\ River River in Turkey, Armenia, Azerbaijan, and Iran. It rises in the mountains south of Erzurum, Turkey, and flows east to join the Kura River in Azerbaijan about 75 mi (120 km) from its mouth. Since a flood in 1897, a separate distributary of the Aras has also emptied into the Caspian Sea. Some 665 mi (1,070 km) long,

it forms the boundary between Armenia and Azerbaijan (north) and Turkey and Iran (south). Located on an island from 180 bc to ad 50 was Armenia's capital, Artaxata.

Aratus of Sicyon \3-'ra-t3s... , sis-e-,an\ (b. 271 — d. 213 bc) Hellenistic Greek statesman, diplomat, and soldier. He democratized Sicyon (251) and, as leader of the Achaean League (in alternate years from 245), set up democracies in league cities and helped free Athens from Macedonia (229). Under him, the league opposed Sparta; with Macedonian help, it defeated Aetolia (217). Aratus nevertheless defied the anti-Roman policy of Philip V of Macedonia; his death, popularly linked to Philip, was more likely caused by tuberculosis.

Araucanian Vg-.rau-'ka-ne-onzN South American Indian people who are now concentrated in the valleys and basins between the Bio Bio and Tolten rivers in south-central Chile. When the Spanish coNQUiSTADORes arrived in Chile, they encountered three Araucanian populations: the Picunche, who were accustomed to Inca control; the Huilliche, who were too few and scattered to resist the conquistadores; and the Mapuche, successful farmers and artisans. The first two were soon assimilated, but the Mapuche managed to resist Spanish and Chilean control for some 350 years. They were subdued in the late 19th century and were settled on reservations; they now live independently.

araucaria \ l ar-o- , kar-e-9\ Any pinelike coniferous plant (see conifer) of the genus Araucaria (family Araucariaceae). Found in South America, the Phoenix Islands, and Australia, araucaria trees are magnificent evergreens, with whorled branches and stiff, flattened, pointed leaves. Common species are the monkey puzzle tree and the Norfolk Island pine, often grown as a houseplant. Several species are cultivated on the Pacific coast of the U.S. and in southern Florida. See also pine.

Arawak \'ar-3-,wak\ American Indians of the Greater Antilles and South America. The Taino, an Arawak subgroup, were the first native peoples encountered by Christopher Columbus on Hispaniola. The island Arawak were wiped out by disease, but some mainland South American Arawak, who inhabited northern and western areas of the Amazon River basin, survived conquest. At the turn of the 21st century, the Arawak lived mainly in Guyana, where they represented about one-third of the Indian population. Smaller numbers live in Suriname, French Guiana, and Venezuela.

Arawakan \,ar-3-'wa-k3n\ languages or Maipuran \ml-'pii-r9n\ languages Largest family of American Indian languages. The family comprises an estimated 65 known languages, of which at least 30 are now

extinct. They stretch from the Caribbean coast of Central America to the Gran Chaco and southern Brazil, and from western Peru to the Guianas and central Brazil. Taino, a now-extinct Arawakan language of the Antilles, was the first American Indian language encountered by Europeans. Arawakan languages that are still viable include Goajiro in Colombia and Venezuela; Amuesha, Machiguenga, and the Campa languages in Peru; and Terena in Brazil.

Arbenz \'ar-bans\ (Guzman), Jacobo (b. Sept. 14, 1913, Quezaltenango, Guat. — d. Jan. 27, 1971, Mexico City, Mex.) Soldier and president of Guatemala (1951-54). The son of a Swiss emigre, Arbenz joined the leftist army officers who overthrew the dictator Jorge Ubico (1 878—1946) in 1944. Elected president in 1951, he made land reform his central project. His efforts to expropriate idle land owned by the United Fruit Co. and his alleged communist links led to an invasion sponsored by the U.S. Central Intelligence Agency. When the army refused to defend Arbenz against what appeared to be a superior force, he resigned and went into exile, and the CIA installed the leader of the proxy army. Col. Carlos Castillo Armas (1914-57), as president.

Arber, Werner (b. June 3, 1929, Granichen, Switz.) Swiss microbiologist. He has taught chiefly at the University of Basel. He shared a 1978 Nobel Prize with Daniel Nathans and Hamilton O. Smith for the discovery and use of restriction enzymes that break the giant molecules of DNA into pieces small enough to be separated for individual study but large enough to retain meaningful amounts of the genetic information of the original substance. He also observed that bacteriophages cause mutation in their bacterial hosts and undergo hereditary mutations themselves.

Arbiter, Gaius Petronius See Gaius Petronius Arbiter

arbitrage Var-bo-.trazhX Business operation involving the purchase of foreign currency, gold, financial securities, or commodities in one market and their almost simultaneous sale in another market, in order to profit

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from price differentials existing between the markets. In the 1980s a form of speculation called risk arbitrage arose, in which speculators tried to identify companies targeted for takeover and buy blocks of their stock, to be resold at a profit when the takeover was announced and the company’s stock rose in value. See also insider trading; security.

arbitration Process of resolving a dispute or a grievance outside a court system by presenting it for decision to an impartial third party. Both sides in the dispute usually must agree in advance to the choice of arbitrator and certify that they will abide by the arbitrator’s decision. In medieval Europe arbitration was used to settle disputes between merchants; it is now commonly used in commercial, labour-management, and international disputes. The procedures differ from those used in the courts, espe-

cially regarding burden of proof and presentation of evidence. Arbitration avoids costly litigation and offers a relatively speedy resolution as well as privacy for the disputants. The main disadvantage is that setting guidelines is difficult; therefore the outcome is often less predictable than a court decision. See also mediation.

arbor Garden shelter providing privacy and partial protection from the weather, most commonly a lightweight, latticed framework (trellis) of wood or metal with interlaced branches of vines or climbing shrubs trained over it. If there is a distinction between an arbor and a bower, it is that the bower is an entirely natural recess whereas an arbor is only partially natural.

arboretum X.ar-bo-'re-tomV Place where trees, shrubs, and sometimes herbaceous plants are cultivated for scientific and educational purposes. An arboretum may be a collection in its own right or a part of a botanical garden. Important U.S. arboretums include the Arnold Arboretum of Harvard University (Jamaica Plain, Mass.) and the U.S. National Arboretum in Washington, D.C.

arboriculture Var-bor-o-.kol-choA Cultivation of trees, shrubs, and woody plants for shading and decorating. Arboriculture includes all aspects of growing, maintaining, and identifying plants, arranging plantings for their ornamental values, and removing trees. The well-being of individual plants is the major concern of arboriculture, in contrast to such related fields as forestry and agriculture, in which the major concern is the welfare of a large group of plants as a whole.

arborvitae \,ar-b3r-'vl-te\ (Latin: “tree of life”) Any of six species (genus Thuja) of resinous, evergreen ornamental and timber conifers of the cypress family, native to North America and eastern Asia. Arborvitae trees or shrubs have thin, scaling outer bark and fibrous inner bark; horizontal or ascending branches; and flattened, spraylike branchlets with scalelike leaves. The Oriental, or Chinese, arborvitae (T. orientalis), a popular ornamental native to Asia, is a gracefully symmetrical shrub. Arborvitae wood is soft and lightweight but very durable, fragrant, and easily worked. The giant arborvitae (T. plicata) is the most important timber-producing species, but the wood of the American arborvitae (T. occidentalis) is also frequently used. False arborvitae (Thujopsis dolabrata) is closely related.

arbovirus X.ar-bo-'vI-rosX Any of a large group of viruses that develop in arthropods (chiefly mosquitoes and ticks). The name derives from “arthropod-borne virus” The spheroidal virus particle is encased in a fatty membrane and contains RNA; it causes no apparent harm to the arthropod host. Arboviruses are transmitted by bites to vertebrate hosts, in which they establish infections and complete their growth cycle; they include the agents responsible for yellow fever and equine encephalitis. See also TOGAVIRUS.

Arbus, Diane orig. Diane Nemerov (b. March 14, 1923, New York, N.Y., U.S. — d. July 26, 1971, New York City) U.S. photographer. The sister of the poet and critic Howard Nemerov, she worked as a fashion photographer in the 1950s. From about 1955 to 1957 she studied with documentary photographer Lisette Model. She published her first photo-essay, for Esquire, in 1960. In the 1960s she began to explore the subjects that would occupy her for much of her career: individuals living on the outskirts of society and “normalcy,” such as nudists, transvestites,

dwarfs, and the mentally or physically handicapped. Her own evident intimacy with the subjects of her photos resulted in images that engage the sympathy and collusion of the viewer and elicit a strong response. During this period she mastered her technique of using a square format and flash lighting, which gives her work a sense of theatricality and surrealism. In 1971 Arbus committed suicide.

Arbuthnot Var-'both-notV John (b. April 1667, Inverbervie, Scot. — d. Feb. 27, 1735, London, Eng.) Scottish mathematician, physician, and satirist. His satirical writings include a political allegory, The History of John Bull (1712), that established John Bull as a personification of England. He was a founding member of the famous Scriblerus Club, which aimed to ridicule bad literature and false learning. He was also chief contributor to and guiding spirit of the Memoirs of Martinus Scriblerus (written 1713-14), a mocking exposure of pedantry that was written by club members.

arbutus \ar-'byu-t3s\ Any of about 14 species (genus Arbutus) of broad-leaved evergreen shrubs or trees, in the heath family. Native to southern Europe and western North America, they are characterized by loosely clustered white or pink flowers and red or orange berries. A. menziesii (variously known as the madrona, Pacific madrona, laurelwood, and Oregon laurel) and A. unedo (the strawberry tree) are cultivated as ornamentals. The trailing arbutus belongs to the genus Epigaea.

Arc de Triomphe Vark-do-tri-'oTX Largest triumphal arch in the world. A masterpiece of Romantic Classicism, it is one of the best-known monuments of Paris. It stands at the centre of the Place Charles de Gaulle, at the western terminus of the Champs- Elysees. Initiated by Napoleon, designed by Jean-Francois-Therese Chalgrin, and constructed in 1806-36, the monument is 164 ft (50 m) high and 148 ft (45 m) wide. Decorative relief sculptures celebrating Napoleon’s victorious military campaigns were executed on the arch by Francois Rude, Jean-Pierre Cortot, and Antoine Etex.

arc furnace Type of electric furnace in which heat is generated by an arc between carbon electrodes above the surface of the material (commonly a metal) being heated. William Siemens first demonstrated the arc furnace in 1879 at the Paris Exposition by melting iron in crucibles; horizontally placed carbon electrodes produced an electric arc above the container of metal. The first commercial arc furnace in the U.S. (1906) had a capacity of four tons (3.6 metric tons) and was equipped with two electrodes. Modern furnaces range in heat size from a few tons up to 400 tons (360 metric tons), and the arcs strike directly into the metal bath from vertically positioned, graphite electrodes to remelt scrap steel or refine briquettes of direct-reduced iron ore.

arcade Series of arches, supported by columns or piers, joined together end to end in a row. When supporting a roof, an arcade may function as a passageway adjacent to a solid wall, a covered walkway that provides access to adjacent shops, or a transitional element surrounding an open internal court. See also colonnade.

Arcadia Ancient country, central Peloponnese, Greece. Mountainous and landlocked, it was not overrun by the Dorians during their occupation of Greece (1100-1000 bc). Its isolation and its pastoral character partly explain why it was represented as a paradise in Greek and Roman bucolic poetry. It was the scene of conflict during the War of Greek Independence (1821-29). The modem Greek department of Arkadhia is nearly coex-tensive with the ancient country.

Arcadian League Confederation of ancient Greek city-states of Arca-dia. Arcadian towns had been forced to ally with Sparta by 550 bc, and most Arcadians remained faithful to Sparta during the Peloponnesian War (431^-04 bc). In an effort to contain Sparta, Epaminondas of Thebes founded the city-state of Megalopolis in 371-368 bc as the seat of the Arcadian League. The League united the Arcadians for a few decades until internal discord crippled their confederation.

Arcaro, Eddie orig. George Edward Arcaro (b. Feb. 19, 1916, Cincinnati, Ohio, U.S. — d. Nov. 14, 1997, Miami, Fla.) U.S. jockey. He became the first jockey to ride five Kentucky Derby winners (1938, 1941, 1945, 1948, 1952) and the first to ride two Triple Crown champions (Whirl-

Arbuthnot, detail of an oil painting by W. Robinson; in the Scottish National Portrait Gallery, Edinburgh.

COURTESY OF THE SCOTTISH NATIONAL PORTRAIT GALLERY, EDINBURGH

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away, 1941; Citation, 1948). In 31 years of riding Thoroughbreds (193 1—61), he won 549 stakes events, a total of 4,779 races, and more than $30 million in purses.

arch Curved structure that spans the opening between two piers or col-umns and supports loads from above. The masonry arch provides the stepping stone from the post-and-beam system to the evolution of the vault, and was first widely used by the Romans. Its construction depends on a series of wedge-shaped blocks (voussoirs) set side by side in a semicir-cular curve or along two intersecting arcs (as in a pointed arch). The cen-tral voussoir is called the keystone, and the two points where the arch rests on its supports are known as the spring points. An arch can carry a

much greater load than a horizontal beam of the same size and material, because downward pressure forces the voussoirs together instead of apart. The resulting outward thrust must be resisted by the arch's supports. Present-day lightweight monolithic (one-piece) arches of steel, concrete, or laminated wood are highly rigid, and thereby minimize horizontal thrust. See illustration opposite.

archaebacteria \,ar-ke-,bak-'tir-e-3\ Group of bacteria whose members differ from the eubacteria in certain physical, physiological, and genetic features (e.g., cell-wall components). Archaebacteria are aquatic or terrestrial microorganisms that exhibit a diversity of shapes, including spherical, rod-shaped, and spiral forms. They survive in various extreme environments, including very hot or salty ones. Some require oxygen; some do not. Some produce methane as an end product; others depend on sulfur for their metabolism.

archaeology Scientific study of material remains of past human life and activities. These include human artifacts from the very earliest stone tools to the man-made objects that are buried or thrown away in the present day. Archaeological investigations are a principal source of modern knowledge of prehistoric, ancient, and extinct cultures. The field emerged as an academic discipline in the late 19th century, following centuries of haphazard antiquarian collecting. Among the archaeologist's principal activities are the location, surveying, and mapping of sites and the excavation, classification, dating, and interpretation of materials to place them in historical context. Major subfields include classical archaeology, the study of ancient Mediterranean and Middle Eastern civilizations; prehistoric archaeology, or general archaeology; and historical archaeology, the study of historic-period remains to augment the written record. See also anthropology; coin collecting; stone-tool industry.

archaeopteryx \ar-ke-'ap-t9-riks\ Oldest known fossil animal that is generally accepted as a bird (classified as genus Archaeopteryx). It flourished during the Late Jurassic period (159-144 million years ago). Fossil specimens indicate that archaeopteryx ranged in size from as small as a blue jay to as large as a chicken. Archaeopteryx shared anatomical characteristics with both birds (well-developed wings and birdlike skull) and theropod dinosaurs (well-developed teeth and a long tail).

Archangel See Arkhangelsk

archbishop In Christianity, a bishop who has jurisdiction, but not superiority, over the other bishops in a province as well as episcopal authority in his own diocese. Introduced as an honorary title in the Eastern churches in the 4th century, the office did not become common in Western churches until the 9th century. It is now most widely used in the Roman Catholic and Eastern Orthodox churches. It is more rarely used in Protestant denominations, though the Church of England has archbishops of Canterbury and York, and the Lutheran churches of both Sweden and Finland have an archbishop.

Archean \ar-'ke-on\ Eon or Archaean Eon or Archeozoic Eon

Older of the two divisions of Precambrian time. The Archean begins with the formation of the Earth's crust c. 3.8 billion years ago and extends to c. 2.5 billion years ago, up to the start of the Proterozoic Eon, the second division of the Precambrian Period. The earliest and most primitive forms of life (bacteria and cyanobacteria) originated c. 3.5 billion years ago in

the middle of the Archean Eon (the Archean’ s alternative name, Archeozoic, means “ancient life”).

archer fish Any of five species (family Toxotidae) of Indo-Pacific fishes noted for their ability to knock their insect prey off overhanging vegetation by shooting it with drops of water expelled from their mouth. Archer fishes are elongated and have a relatively deep body that is almost flat from the dorsal fin forward. The head is pointed, the mouth is large, and the dorsal

crown

trefoil arch ogee arch

The arch supports a vertical load primarily by axial compression of its wedge-shaped voussoirs. As shown on the Roman arch, the first voussoir, or springer, rests on the impost, at the top of the abutment or pier. The haunch, rising from the impost to the crown (highest point), is defined by the inner curve, or intrados, and outer curve, or extrados. The Roman arch, with its semicircular intrados, has a rise exactly half the width of the span. Below it are shown examples of the curved arch (left) and the pointed arch (right). The stilted arch has vertical sides. A Moorish arc widens above the spring points. The trefoil arch's intrados has three indentations, or foils. A Gothic arch is a pointed arch usually having two haunches of equal radii of curvature. A Tudor arch has greater curvature near the springers than near the point. Each haunch of the ogee arch consists of a double curve.

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and anal fins are placed toward the back of the body. Different species are spotted or vertically banded with black. Archer fishes live in both fresh and salt water, usually remaining near the surface. One well-known spe-

cies (Toxotes jaculator, or jaculatrix) grows to about 7 in. (18 cm) long.

archery Sport of shooting with bow and arrow. As the bow began to be replaced by the gun as the principal weapon of warfare and the hunt beginning in the 16th century, it increasingly became a sporting device. By the mid- 19th century, many archery clubs had sprung up in England and the U.S. Competitions including target- shooting were held at the Olympic Games in the early 20th century, but were then suspended until 1972. Other varieties of archery include field archery, or roving (a simulation of hunting), and flight shooting (a distance event).

Arches National Park Preserve, eastern Utah, U.S. Located on the Colorado River north of Moab, the preserve was established as a national monument in 1929 and as a national park in 1971. Its area is about 120 sq mi (310 sq km). The park’s sandstone has been eroded into unusual shapes, including Courthouse Towers, Fiery Furnace, and Devils Garden, the site of Landscape Arch, at 306 ft (93 m) the longest freestanding natural rock bridge in the world.

archetype \'ar-ki-,tlp\ Primordial image, character, or pattern of circumstances that recurs throughout literature and thought consistently enough to be considered universal. Literary critics adopted the term from Carl Gustav Jung’s theory of the collective unconscious. Because archetypes originate in pre-logical thought, they are held to evoke startlingly similar feelings in reader and author. Examples of archetypal symbols include the snake, whale, eagle, and vulture. An archetypal theme is the passage from innocence to experience; archetypal characters include the blood brother, rebel, wise grandparent, and prostitute with a heart of gold.

Archimedean screw N.ar-ko-'med-e-oM or Archimedes' screw

Machine for raising water, said to have been invented by Archimedes for removing water from the hold of a large ship. One form consists of a circular pipe enclosing a helix and inclined at an angle of about 45°, with its lower end dipped in the water; rotation of the device lifts the water in the pipe. Other forms consist of a helix revolving in a fixed cylinder or a helical tube wound around a shaft.

Archimedes V.ar-ks-'me-.dezX (b. c. 290-280 bc, Syracuse, Sicily — d. 212/211 bc, Syracuse) Legendary Greek inventor and mathematician. His principal discoveries were the Archimedes screw, an ingenious device for raising water, and the hydrostatic principle, or Archimedes' principle. His main interests were optics, mechanics, pure mathematics, and astronomy. Archimedes’ mathematical proofs show both boldly original thought and a rigour meeting the highest standards of contemporary geometry. His approximation of n was not improved on until after the Middle Ages, and translations of his works were important influences on 9th-century Arab and 16th- and 17th-century European mathematicians. In his native city, Syracuse, he was known as a genius at devising siege and countersiege weapons. He was killed by a Roman soldier during the storming of the city.

Archimedes' principle Law of buoyancy, discovered by Archimedes, which states that any object that is completely or partially submerged in a fluid at rest is acted on by an upward, or buoyant, force. The magnitude of this force is equal to the weight of the fluid displaced by the object. The volume of fluid displaced is equal to the volume of the portion of the object submerged.

Archipenko X.ar-ko-'peq-koV Alexander (b. May 30, 1887, Kiev, Ukr. — d. Feb. 25, 1964, New York, N.Y., U.S.) Ukrainian-U.S. sculptor. In 1908 he moved to Paris to study at the Ecole des Beaux- Arts, and he soon became active in radical circles such as the Cubist movement. He began to explore the interplay between interlocking voids and solids and between convex and concave surfaces, forming a sculptural equivalent to Cubist paintings' overlapping planes and, in the process, revolutionizing modern sculpture. About 1912 he introduced the concept of collage in sculpture, and he went on to further defy tradition in his "sculpto-paintings," works in which he introduced painted colour to the intersecting planes of his sculpture. In 1923 he moved to New York City, where he worked and taught for most of his life.

architecture Art and technique of designing and building, as distinguished from the skills associated with construction. The practice of architecture emphasizes spatial relationships, orientation, the support of activities to be carried out within a designed environment, and the arrangement and visual rhythm of structural elements, as opposed to the

design of structural systems themselves (see civil engineering). Appropriateness, uniqueness, a sensitive and innovative response to functional requirements, and a sense of place within its surrounding physical and social context distinguish a built environment as representative of a culture's architecture. See also building construction.

archives Repository for an organized body of records. Archives are produced or received by a public, semipublic, institutional, or business entity in the transaction of its affairs and are preserved by it or its successors. The modern institution of archives and archival administration dates from the late 18th century, when national and departmental archives were established in France. In the U.S. the National Archives was established in 1934 to house the retired records of the national government; the Federal Records Act of 1950 authorized regional records repositories. Each U.S. state has its own archival agency. Archivists in the 20th century increasingly handled records involving new technologies, such as computer-kept records and motion pictures, as well as the records of businesses, institutions, and individuals.

archon In ancient Greece, the chief magistrate or magistrates in a city-state, from the Archaic period onward. In Athens, nine archons divided state duties: the archon eponymous headed the boule and Ecclesia, the polemarch commanded troops and presided over legal cases involving foreigners, the archon basileus headed state religion and the Areopagus, and the six remaining archons handled various judicial matters. At first only elected aristocrats could serve, and their term was for life; later, terms were limited to a year. Archons were chosen by a combination of election and lot. In the 5th century bc the authority of the archons declined as elected generals assumed most of their powers.

Archon \'ar-,kan\ In Gnosticism, any of various world-governing powers created with the material world by the Demiurge. Because the Gnostics regarded the material world as evil or as the product of error, Archons were considered forces of evil. Seven or 12 in number, they were identified with the seven planets of antiquity or the 12 signs of the zodiac. They were thought to have imprisoned the divine spark of human souls in material creation. The gnosis sent from the realms of divine light through Jesus enabled Gnostic initiates to pass through the spheres of the

Archons into the realms of light.

archosaur Var-k3-,s6r\ Any of the various advanced reptiles in the subclass Archosauria (“ruling reptiles”), including all thecodonts, pterosaurs, dinosaurs, birds, and crocodilians. The first known archosaurs appeared 242-227 million years ago during the Triassic Period. All early archosaurs possessed an ankle specialization that aided in upright posture, and most had long hindlegs and short forelimbs. Unlike the teeth of earlier reptiles, which were set in a shallow groove, the teeth of archosaurs were (and are) set in sockets.

Archytas \ar-'ki-tas\ (fl. 400-350 bc, Tarentum, Magna Graecia) Greek scientist, philosopher, and Pythagorean mathematician. Archytas is sometimes called the founder of mathematical mechanics. Plato, a close friend, made use of his work in mathematics, and there is evidence that Euclid borrowed from Archytas for Book VIII of the Elements. An influential public figure, he served seven years as commander in chief of his city, Tarentum (now Taranto, Italy).

Arcimboldo V.ar-chem-'bol-doV Giuseppe (b. c. 1527, Milan — d. 1593, Milan) Italian painter. He began his career as a painter and designer of stained-glass windows for Milan Cathedral. In 1562 he moved to Prague and became court painter to the emperors Ferdinand I and Rudolf II. He also painted scenery for the court theatre and became skillful at illusionistic imagery containing allegorical meanings, puns, and jokes. He is known for his eccentric and grotesque Mannerist compositions of fruits, vegetables, animals, landscapes, and implements arranged to resemble human forms. The style was regarded as being in poor taste until the Surrealists revived the art of visual punning in the 1920s. See photograph on opposite page.

Arctic Archipelago Group of Canadian islands, Arctic Ocean. They lie north of the Canadian mainland and have an area of about 550,000 sq mi (1,424,500 sq km). The southeastern islands are an extension of the Canadian Shield; the balance consists of the Arctic lowlands to the south and the Innuitian Mountains to the north. The archipelago includes the large islands of Baffin, Ellesmere, Victoria, Banks, and Prince of Wales.

Arctic Circle Parallel of latitude approximately 66.5° north of the Equator that circumscribes the northern frigid zone. It marks the southern limit

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of the area within which, for one day or more each year, the sun does not set or rise. The length of continuous day or night increases northward from the Arctic Circle, mounting to six months at the North Pole.

Arctic fox Northern fox (Alopex lagopus) found throughout the Arctic, usually on tundra or mountains near the sea. Its short, rounded ears and short muzzle reduce its body area exposed to heat loss, and it has fur-covered soles. It is 20-24 in. (50-60 cm) long (excluding the 12-in., or

30-cm, tail) and weighs 7-17 lbs (3-8 kg). It has two colour phases. Individuals in the white phase are grayish brown in summer and white in winter; those in the blue phase (blue foxes of the fur trade) are grayish in summer and gray-blue in winter. The Arctic fox dwells in burrows and feeds on any available animal or vegetable material.

Arctic National Park, Gates of the See Gates of the Arctic National Park

Arctic Ocean Ocean centring approximately on the North Pole. Smallest of the world's oceans, it is almost completely surrounded by the landmasses of Eurasia and North America, and it is distinguished by a cover of ice. Lands in it and adjacent to it include Point Barrow in Alaska, the Arctic Archipelago, Greenland, Svalbard, Franz Josef Land, and northern Siberia. The ocean covers about 5,440,000 sq mi (14,090,000 sq km) and reaches a maximum depth of about 18,000 ft (5,500 m). Its marginal seas include the Barents, Beaufort, Chukchi, East Siberian, Greenland, Kara, Laptev, and White seas. Areas within the Arctic Circle were first explored beginning in the 9th century by the Norse. In the 1 6th— 1 7 th centuries explorers searching for the Northwest Passage reached the area; Martin Frobisher discovered the southern part of Baffin Island (1576-78), and Henry Hudson navigated the eastern coast of Hudson Bay (1610-11). Later explorers included Roald Amundsen, Fridtjof Nansen, Robert E. Peary, and Richard E. Byrd. Development of the area's natural resources was spurred by the discovery of oil in Alaska in the 1960s. Virtually all of the Arctic has now been mapped. See map opposite.

Arctic tern Tern species {Sterna paradisaea) that makes the longest annual migration of any bird. It breeds in the southerly reaches of the Arctic and winters in the Antarctic, making its migration a round-trip of nearly 22,000 mi (over 35,000 km). Its appearance — white with a black cap and grayish wings — is similar to that of the common tern (S . hirundo), its frequent companion.

Ardea \'ar-de-o\ Ancient town, Italy. Located south of Rome, Ardea was ruled by the Rutuli people and was an important center for the cult of Juno. In 444 bc the town signed a treaty with the Romans, who colonized it as a barrier against the Volsci. It declined in the Roman civil wars of the 1st century bc.

Arden, Elizabeth orig. Florence Nightingale Graham (b. Dec. 31, 1884, Woodbridge, Ont., Can. — d. Oct. 18, 1966, New York, N.Y., U.S.) Canadian-U.S. businesswoman who founded a chain of women's salons. Graham moved to New York c. 1908, where she opened a beauty salon under the name Elizabeth Arden. She was instrumental in making cosmetics acceptable for respectable women. In 1915 she began to market her cosmetics products internationally. At her death there were over 100 Elizabeth Arden salons throughout the world.

Arden, John (b. Oct. 26, 1930, Barnsley, Yorkshire, Eng.) British playwright. He studied architecture at Cambridge and the Edinburgh College of Art. His plays mix poetry and songs with colloquial speech in a boldly theatrical manner and involve

strong conflicts purposely left unresolved. Arden’s works include All Fall Down (1955), Serjeant Musgrave’s Dance (1959), The Workhouse Donkey (1963), Vandaleur’s Folly (1978), and the radio series Whose Is the Kingdom? (1988).

Ardennes \ar-'den\ or Forest of Ardennes Wooded plateau region, northwestern Europe. It covers over 3,860 sq mi (10,000 sq km) and

"Summer," painting on canvas by Giuseppe Arcimboldo, 1 563; in the Kunsthistorisches Museum, Vienna

BY COURTESY OF THE KUNSTHISTORISCHES MUSEUM, VIENNA; PHOTOGRAPH, ERWIN MEYER

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includes parts of Belgium, Luxembourg, and the Meuse River valley of France; its average height is about 1,600 ft (488 m). Though half of it is covered with forests, the soil is generally unfertile and supports only heath. It is located in the middle of the heavily populated triangle of Paris, Brussels, and Cologne. During World Wars I and II, the area was the scene of severe fighting in 1914, 1918, and 1944 (see Battle of the Bulge).

Ardhanarisvara V.ar-do-na-'resh-vo-roX Composite male-female figure of the Hindu god Shiva and his consort Parvati. In many Indian and S.East Asian sculptures, the right half is male and the left female. The figure symbolizes the inseparability of male and female principles.

Ards District (pop., 2001: 73,244), Northern Ireland. Formerly part of County Down, Ards was established as a district in 1973. Much of its land is devoted to crops and pasture. Newtownards, settled c. 1608 by Scots, is its administrative seat and manufacturing centre. Donaghadee is a popular resort town.

area See length, area, and volume

Arecibo \,ar-9-'se-bo\ Observatory Astronomical observatory near Arecibo, P.R., site of the world’s largest single-unit radio telescope (as opposed to multiple telescope interferometers such as the Very Large Array). The telescope dish, 1 ,000 ft (300 m) across, is built into a valley; celestial sources are tracked across the sky by moving secondary structures suspended about 500 ft (150 m) above the dish. The observatory has produced detailed radar maps of the surface of Venus and near-Earth asteroids (see Earth-crossing asteroid), made detailed studies of Earth’s ionosphere, and made major contributions to studies of pulsars and hydrogen gas in GALAXIES.

arena stage See theater-in-the-round

Arendt \a-'rent\, Hannah (b. Oct. 14, 1906, Hannover, Ger. — d. Dec. 4, 1975, New York, N.Y., U.S.) German-bom U.S. political philosopher.

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She studied philosophy at the Universities of Marburg, Freiburg, and Heidelberg, receiving a doctorate from the latter in 1928. While at Marburg she began a romantic relationship with her teacher Martin Heidegger. Following the Nazi takeover of Germany in 1933, Arendt, who was Jewish, fled to Paris, where she became a social worker, and then to New York City in 1941. Her major work. Origins of Totalitarianism (1951), traced totalitarianism to 19th-century anti-Semitism, imperialism, and the disintegration of the traditional nation-state. Her highly controversial book Eichmann in Jerusalem (1963) argued that the Nazi war criminal Adolf Eichmann was not inwardly wicked or depraved but merely “thoughtless”; his role in the extermination of the Jews thus epitomized the fearsome “banality of evil” that had swept across Europe at the time. Resuming contact with Heidegger in 1950, she claimed that his involvement with the Nazis had been the “mistake” of a great philosopher. She taught at the University of Chicago (1963-67) and thereafter at the New School for Social Research in New York City.

Areopagus \,ar-e-'a-p9-g3s\ Supreme tribunal of ancient Athens. It was named for the Areopagus (“Ares’ Hill”), where it met. It began as the king’s council; by Draco’s code of law (c. 621 bc) it consisted of former archons, but Solon (594) opened candidacy to any citizen. It had broad judicial powers. Its prestige fluctuated from the mid 6th to the mid 4th century bc, after which its power revived and continued under Roman domination, when it reacquired extensive administrative duties.

Arequipa \,a-ra-'ke-pa\ City (pop., 1998 est.: 710,103), southern Peru. Located in the Andes Mountains at an elevation of 7,557 ft (2,303 m) at the foot of Misti Volcano (19,098 ft [5,821 m]), it has been subject to earthquakes, usually associated with volcanic activity, and was largely destroyed by an earthquake in 1868. In the Inca empire, Arequipa was an important point on the route from Cuzco to the seacoast. Modern Arequipa is the commercial centre of southern Peru.

Ares \'ar-ez\ Greek god of war. Unlike his Roman counterpart, Mars, his worship was not extensive. From the time of Homer, he was one of the Olympian deities, the son of Zeus and Hera, but disliked by the other gods.

His worship occurred largely in northern Greece. He was associated from early times with Aphrodite, occasionally portrayed as his legitimate wife and at other times his lover. He was accompanied in battle by his sister Eris (strife) and by two of his children by Aphrodite, Phobos and Deimos (Panic and Rout).

Aretino \,a-ra-'te-no\, Pietro (b.

April 20, 1492, Arezzo, Republic of Florence [Italy] — d. Oct. 21, 1556,

Venice) Italian poet, prose writer,

and dramatist. He was celebrated throughout Europe in his time for his bold and insolent literary attacks on the powerful. His fiery letters and dialogues are of great biographical and topical interest. His dramas, which are relatively free of venomous assaults, include five comedies and a tragedy, Orazia (1546), perhaps the best Italian tragedy of the 16th century.

Arevalo \,a-ra-'ba-lo\ (Bermejo), Juan Jose (b. Sept. 10, 1904, Taxisco, Guat. — d. Oct. 6, 1990, Guatemala City) President of Guatemala (1945-51). Soon after earning his doctorate, he went to Argentina, where he held various academic positions. After the overthrow of the Guatemalan dictator Jorge Ubico, he was elected president, receiving 85 percent of the vote. He established freedom of speech and of the press, and his administration inaugurated a social security system, a labour code, and important education and health programs. His policies favoured urban and agricultural workers and the indigenous population. He stepped down voluntarily at the end of his term. A military coup prevented him from running again in 1963.

Argentina officially Argentine Republic Country, southern South America. Area: 1,073,400 sq mi (2,780,092 sq km). Population (2005 est.): 38,592,000. Capital: Buenos Aires. The people are mostly of Euro-

gions: Christianity (predominantly Roman

Catholic [official]; also Protestant); also Islam, Judaism. Currency: Argentine peso. Argentina can be divided into four general regions: the North, the Pampas, Patagonia, and the Andes Mountains. The subtropical plains in the northeast are divided by the Parana River into Mesopotamia to the east and Gran Chaco to the west and north. The Pampas, south and west of the Parana, is one of the world’s most productive agricultural areas and the country’s most populous region. Patagonia lies south of the Colorado River. The Argentine Andes include the continent’s highest peak, Mount Aconcagua. Argentina’s hydrology is dominated by rivers that include the Parana, Uruguay, and Pilcomayo, which drain into the Rio de la Plata. Argentina has a developing economy based largely on manufacturing and agriculture; it is Latin America’s largest exporter of beef and beef products. It is a republic with two legislative houses; the head of state and government is the president. Little is known of the indigenous population before the Europeans’ arrival. The area was explored for Spain by Sebastian Cabot beginning in 1526; by 1580 Asuncion, Santa Fe, and Buenos Aires had been settled. Early in the 17th century it was attached to the Viceroyalty of Peru, but in 1776 it was included with regions of modem Uruguay, Paraguay, and Bolivia in the Viceroyalty of the Rio de la Plata, whose capital was Buenos Aires. With the establishment of the United Provinces of the Rio de la Plata in 1816, Argentina achieved its independence from Spain, but its boundaries were not set until the early 20th century. In 1943 the government was overthrown by the military; Col. Juan Peron took control in 1946. He in turn was overthrown in 1955. He returned in 1973 after two decades of turmoil. His third wife, Isabel,

Ares, classical sculpture; in the
National Roman Museum, Rome

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became president on his death in 1974 but lost power after another military coup in 1976. The military government tried to take the Falkland Islands (Islas Malvinas) in 1982 but was defeated by the British in the Falkland Islands War, with the result that the government returned to civilian rule in 1983. The government of Raul Alfonsin worked to end the human rights abuses that had characterized the former regimes. Hyperinflation, however, led to public riots and Alfonsin' s party's electoral defeat in 1989; his Peronist successor, Carlos Menem, instituted laissez-faire economic policies. In 1999 Fernando de la Rua of the Alliance coalition was elected president, and his administration struggled with rising unemployment, heavy foreign debt, and government corruption.

Argerich \'ar-ger-ich\, Martha (b. June 5, 1941, Buenos Aires, Arg.) Argentine pianist. A prodigy, she began concertizing before she was 10. In 1955 she went to Europe, where her teachers included Arturo Benedetti Michelangeli (1920-95). She won two prestigious competitions at age 16 and the Chopin competition in 1965. Her exceptionally brilliant technique, emotional depth, and elan won her an enthusiastic international following.

arginine \'ar-j3-,nen\ One of the essential amino acids, particularly abundant in histones and other proteins associated with nucleic acids. It plays an important metabolic role in the synthesis of UREA, the principal form in which mammals excrete nitrogen compounds. Arginine is used in medicine and biochemical research, in pharmaceuticals, and as a dietary supplement.

argon Chemical element, chemical symbol Ar, atomic number 18. Colourless, odourless, and tasteless, it is the most abundant of the noble GAS es on Earth and the one most used in industry. It constitutes about 1 % of air and is obtained by distillation of liquid air. Argon provides an inert gas shield in welding and brazing, in lightbulbs and lasers, in Geiger counters, and in the production and fabrication of certain metals. Because a radioactive form of argon is produced by decay of a naturally occurring radioactive potassium isotope, it can be used to date rocks and samples more than 100,000 years old.

argon-argon dating See potassium-argon dating

Argonauts In Greek legend, a band of 50 heroes who went with Jason in the ship Argo to retrieve the Golden Fleece from the grove of Ares at Colchis. They had many adventures before arriving at Colchis, from which they were eventually forced to flee, pursued by Medea's father, Aeetes. The Argo eventually returned to Jason's home kingdom (Iolcus) and was placed in a grove sacred to Poseidon; Jason died when its prow toppled as he was resting in its shadow.

Argos Ancient city-state, northeastern Peloponnese, Greece. Under the Argive king Pheidon, it was the dominant city-state in the Peloponnese in the 7th century bc until the rise of Sparta. After suffering incursions from Macedonia,

Argos joined the Achaean League in 229 bc. Later it came under Roman rule. The city flourished in Byzantine times but ultimately fell to the Ottoman Empire in the 16th century. During the War of Greek Independence (1821-29), the first free Greek Parliament was convened at Argos. The modern town (pop., 1991: 22,429) is an agricultural centre.

argument from design or teleological argument Argument for the existence of God. According to one version, the universe as a whole is like a machine; machines have intelligent designers; like effects have like causes; therefore, the universe as a whole has an intelligent designer, which is God. The argument was propounded by medieval Christian thinkers, especially St. Thomas Aquinas, and was developed in great detail in the 17th and 18th centuries by writers such as Samuel Clarke (1675–1729) and William Paley. It was powerfully criticized by David Hume in his Dialogues Concerning Natural Religion. Immanuel Kant also rejected the

argument. In the late 20th century the argument was revived as the doctrine of intelligent design. See also creationism.

Argun Var-'giiM River Chinese Ergun He or O-erh-ku-na

Vo-'ar-'gii-'naV Ho River, northeastern Asia. Rising in the Da Hinggan (Greater Khingan) Range, it runs about 1,000 mi (1,600 km), forming part of the boundary between northeastern China and Russia and uniting with the Shilka River to form the Amur River. In its upper course it is called the Hailar.

arhat \'ar-hot\ or arahant Va-ro-hantX In Buddhism, one who has gained insight into the true nature of existence, has achieved nirvana, and will not be reborn. Theravada Buddhism regards becoming an arhat as the goal of spiritual progress. It holds that a seeker must pass through three earlier stages before being reborn in a heaven as an arhat. Mahayana Buddhism criticizes the goal of becoming an arhat as selfish and considers the

bodhisattva to be a higher goal because the bodhisattva remains in the cycle of rebirths to work for the good of others. This divergence of opinion is one of the fundamental differences between Theravada and Mahayana Buddhism.

Arhus or Aarhus Vor-.husV Seaport (pop., 2001: 286,688), eastern Jutland, Denmark. It lies along Arhus Bay and has an extensive harbour. Its origins are unknown, but it became a bishopric in ad 948 and, with its many religious institutions, prospered during the Middle Ages. In modern times, industrialization and harbour expansion have made it Denmark’s second largest city.

aria Solo song with instrumental accompaniment in opera, cantata, or oratorio. The strophic or stanzaic aria, in which each new stanza might represent a melodic variation on the first, appeared in opera in Claudio Monteverdi’s Orfeo (1607) and was widely used for decades. The standard aria form c. 1650-1775 was the da capo aria, in which the opening melody and text are repeated after an intervening melody-text section (often in a different key, tempo, and metre); the return of the first section was often virtuosically embellished by the singer. Comic operas never limited themselves to da capo form. Even in serious opera, from c. 1750 a variety of forms were used; Gioacchino Rossini and others often expanded the aria into a complete musical scene in which two or more conflicting emotions were expressed. Richard Wagner’s operas largely abandoned the aria in favour of a continuous musical texture, but arias have never ceased to be written.

Ariadne \,ar-e-'ad-ne\ In Greek mythology, the daughter of Pasiphae and King Minos of Crete. She fell in love with Theseus, who had promised to slay the Minotaur confined in Minos’s Labyrinth. She gave Theseus a ball of thread or glittering jewels that enabled him to mark his path and thus to escape the Labyrinth after killing the monster. Endings to the legend vary. In one, Theseus abandons Ariadne and she hangs herself; in others, he carries her to Naxos, where she either dies or marries the god Dionysus. See also Phaedra.

Arianism Christian heresy that declared that Christ is not truly divine but a created being. According to the Alexandrian presbyter Arius (4th century), God alone is immutable and self-existent, and the Son is not God but a creature with a beginning. The Council of Nicaea (ad 325) condemned Arius and declared the Son to be “of one substance with the father.” Arianism had numerous defenders for the next 50 years but eventually collapsed when the Christian emperors of Rome Gratian and Theodosius assumed power. The First Council of Constantinople (381) approved the Nicene Creed and proscribed Arianism. The heresy continued among the Germanic tribes through the 7th century, and similar beliefs are held in the present day by the Jehovah's WiTNESSes and by some adherents of Unitarianism.

Arias Sanchez Var-e-as-'san-chas\, Oscar (b. Sept. 13, 1941, Heredia, Costa Rica) President of Costa Rica (1986-90). A moderate socialist born to wealth, Arias worked for the National Liberation Party from the 1960s. He became president at a time when much of Central America was torn by civil war. His 1987 Central American peace plan, signed by the leaders of El Salvador, Guatemala, Honduras, and Nicaragua, included provisions for cease-fires, free elections, and amnesty for political prisoners. He was awarded the 1987 Nobel Peace Prize.

Aries (Latin: “Ram”) In astronomy, the constellation lying between Pisces and Taurus; in astrology, the first sign of the zodiac, governing approximately the period March 21-April 19. It is represented by a ram, which is sometimes identified with the Egyptian god Amon. In Greek

The Argonauts, detail of a painting by Lorenzo Costa in the Civic Museum, Padua, Italy

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mythology Aries was identified with the ram that carried the prince Phrixus out of Thessaly to Colchis. Phrixus sacrificed the ram to Zeus, who placed it in the heavens as a constellation. Its golden fleece was later recovered by Jason.

Ariha See Jericho

aril \'ar-il\ Special covering of certain seeds that commonly develops from the seed stalk. It is often a bright-coloured fleshy envelope, as in such woody plants as the yews and nutmeg and in members of the arrow-root family, oxalis, and the castor-oil plant. Animals are attracted to arils and eat the seeds, dispersing them in their wastes. The aril of nutmeg is the source of the spice known as mace.

Arion \3-'ri-3n\ Semilegendary Greek poet and musician. He lived at Methymna on the island of Lesbos and is identified as the inventor of the dithyramb. He was sailing homeward after a performing tour when the sailors decided to kill him and steal his wealth. After singing a dirge for himself, he jumped overboard, but a dolphin charmed by his music carried him to shore. He reached Corinth before the ship; when the sailors arrived, the ruler Periander forced them to confess and punished them. Arion’ s lyre and the dolphin were placed in the heavens as the constellations Lyra and Delphinus.

Ariosto V.ar-e-'o-stoV Ludovico (b. Sept. 8, 1474, Reggio Emilia, duchy of Modena [Italy] — d. July 6,

1533, Ferrara) Italian poet. His epic poem Orlando Furioso (1516) is regarded as the finest literary expression of the Italian Renaissance. It enjoyed immediate popularity throughout Europe and was highly influential. He also wrote five com-

edies based on Latin classics but inspired by contemporary life; though minor in themselves, they are among the first of the imitations of Latin comedy in the vernacular that would long characterize European comedy. He also composed seven satires (1517-25) modeled after those of Horace .

Aristagoras \,ar-9-'stag-9-r9s\ (d.

497) Tyrant of Miletus. He assumed his regency from his father-in-law,

Histiaeus (d. 494 bc), who had lost the trust of the Persian emperor, Darius I. Possibly incited by Histiaeus, and with support from Athens and Eretria, Aristagoras raised the Ionian revolt against Persia. Defeated, he left Miletus to found a colony in Thrace, where he was killed by Thracians.

Aristarchus \,ar-3-'star-k3s\ of Samos (b. c. 310 bc — d. c. 230 bc) Greek astronomer. His advanced ideas on the movement of the Earth (which he asserted revolved around the Sun) are known from Archimedes and Plutarch. His only surviving work is the short treatise “On the Sizes and Distances of the Sun and Moon”; though the values he obtained are inaccurate, he showed that the Sun and stars are at immense distances. A peak in the centre of a lunar crater named for him is the brightest formation on the Moon.

Aristide V.ar-i-'stedV Jean-Bertrand (b. July 15, 1953, Port Salut, Haiti) First president of Haiti (1991, 1994-96, 2001-04) to be elected in free democratic elections. A priest in the Roman Catholic Salesian order, he aligned himself with the poor and opposed the harsh regime of Jean-Claude Duvalier, son of Francois Duvalier, often putting himself at odds with the church hierarchy and the military. Expelled by the Salesians in 1988, he formally requested that he be relieved of his priestly duties in 1994. In 1990 progressive-centre forces united behind Aristide and swept him into power. He initiated dramatic reforms but was ousted in a military coup after only seven months in office. Though restored to office in 1994 with the help of U.S. occupying troops, he received little aid with which to address his country’s endemic ills. Constitutionally prohibited from seeking a consecutive term, he stepped down in 1996 but remained Haiti’s most potent political figure. In 2000 he was reelected president

amid charges of electoral fraud. A coup against Aristide failed in 2001, but unrest with his rule increased until a full-scale rebellion in 2004 forced him to flee the country.

Aristides \,ar-3-'stI-dez\ (2nd century ad) Athenian philosopher, one of the earliest Christian Apologists. His Apology for the Christian Faith discussed the harmony in creation and the nature of the divine being and stated that barbarians, Greeks, and Jews were all inadequate in their conception of the deity and their religious practices. Long considered lost, the Apology was reconstructed in the late 19th century.

Aristides the Just (fl. 5th century bc) Athenian statesman and general. He was ostracized in 482 bc, probably for opposing Themistocles but was recalled in 480 and helped defeat the Persians at the battles of Salamis and Plataea. In 478 he helped Sparta's eastern allies form the Delian League; allied with Athens and based on Athenian naval power and the trust Aristides inspired, the league effectively became the Athenian empire.

aristocracy V.ar-o-'sta-kro-seX Originally, leadership by a small privileged class or a minority thought to be best qualified to lead. Plato and Aristotle considered aristocrats to be those who are morally and intellectually superior, and therefore fit to govern in the interests of the people. The term has come to mean the upper layer of a stratified group. Most aristocracies have been hereditary, and many European societies stratified their aristocratic classes by formally titling their members, thereby making the term roughly synonymous with nobility. See also oligarchy.

Aristophanes \ l ar-o- , sta-f3- l nez\ (b. c. 450 — d. c. 388 bc) Greek playwright. An Athenian, he began his career as a comic dramatist in 427. He wrote approximately 40 plays, of which 1 1 survive, including The Clouds (423), The Wasps (422), The Birds (414), Lysistrata (411), and The Frogs (405). Most of the plays typify the Old Comedy (of which they are the only extant representatives), in which mime, chorus, and burlesque were important features. His satire, wit, and merciless topical commentary made him the greatest comic dramatist of ancient Greece.

Aristotle (b. 384, Stagira — d. 322 bc, Chalcis) Greek philosopher and scientist whose thought determined the course of Western intellectual history for two millenia. He was the son of the court physician to Amyntas III, grandfather of Alexander the Great. In 367 he became a student at the Academy of Plato in Athens; he remained there for 20 years. After Plato's death in 348/347, he returned to Macedonia, where he became tutor to the young Alexander. In 335 he founded his own school in Athens, the Lyceum. His intellectual range was vast, covering most of the sciences and many of the arts. He worked in physics, chemistry, biology, zoology, and botany; in psychology, political theory, and ethics; in logic and metaphysics; and in history, literary theory, and rhetoric. He invented the study of formal logic, devising for it a finished system, known as syllogistic, that was considered the sum of the discipline until the 19th century; his work in zoology, both observational and theoretical, also was not surpassed until the 19th century. His ethical and political theory, especially his conception of the ethical virtues and of human flourishing ("happiness"), continue to exert great influence in philosophical debate. He wrote prolifically; his major surviving works include the Organon, De Anima ("On the Soul"), Physics, Metaphysics, Nicomachean Ethics, Eudemian Ethics, Magna Moralia, Politics, Rhetoric, and Poetics, as well as other works on natural history and science. See also teleology.

arithmetic Branch of mathematics that deals with the properties of numbers and ways of combining them through addition, subtraction, multiplication, and division. Initially it dealt only with the counting numbers, but its definition has broadened to include all real numbers. The most important arithmetic properties (where a and b are real numbers) are the commutative laws of addition and multiplication, a + b = b + a and ab = ba; the associative laws of addition and multiplication, a + (b + c) = (a + b) + c and a{bc) = {ab)c\ and the distributive law, which connects addition and multiplication, a(b + c) = ab + ac. These properties include subtraction (addition of a negative number) and division (multiplication by a

FRACTION).

Arius \'ar-e-3s\ (b. c. 250, Libya — d. 336, Constantinople, Byzantine Empire) Christian priest and heretic whose teachings gave rise to the doctrine of Arianism. He was leader of a Christian community near Alexandria, Egypt, where he preached doctrines that combined Neoplatonism with a literal, rationalist interpretation of biblical texts. By asserting the absolute oneness and immutability of God, he called into question the divinity of Christ. His views were publicized through his major work, Thalia

Ariosto, woodcut after a drawing by Titian from the third edition of Orlando furioso, 1532.

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(c. 323). In 325 the Council of Nicaea declared him a heretic. He was striving to compromise his views and win readmission to the church when he died suddenly in Constantinople. The Arian heresy posed a threat to Christian orthodoxy for several centuries.

Arizona State (pop., 2000: 5,130,632), southwestern U.S. Bordered by Mexico and the U.S. states of Utah, New Mexico, California, and Nevada, it covers 113,999 sq mi (295,256 sq km). Its capital is Phoenix. Its highest point is Humphreys Peak, at 12,633 ft (3,850 m). The site of Grand Canyon and Petrified Forest national parks, Arizona also contains much of America’s Indian tribal lands. Humans settled the area more than 25,000 years ago. Nomadic Apache and Navajo Indians arrived after the collapse of the Anasazi and Hohokam civilizations. They were followed in the 16th century by Spanish treasure seekers from Mexico, including Francisco Vazquez de Coronado, establishing Mexico’s claim to the area. In 1776 the Mexican army built a presidio at Tucson. After the Mexican War, Arizona was ceded to the U.S. as part of New Mexico in 1848; the Gadsden Purchase added to it in 1853. Organized as a territory in 1863, Arizona became the 48th state in 1912. Though still lightly populated, it has grown rapidly in population in recent decades, largely because of its climate. About one-fifth of the population is Spanish-speaking, while about 5% is American Indian, including Navajo, Hopi, Apache, Papago, and Pima. Its diverse economy includes agriculture, mining, aerospace, electronics, and tourism.

Arjan \'9r-jon\ (b. 1581 — d. 1606) Fifth Guru of the Sikhs (1581-1606) and jts first martyr. He compiled the volume of Sikh scripture on which the Adi Granth is based, and he completed the Golden Temple at Amritsar, India. The first Guru to serve as both temporal and spiritual head of Sikhism, he built up Amritsar as a commercial centre and enlarged missionary efforts. He was also a prolific poet and writer of hymns. He prospered under the tolerant Mughal emperor Akbar but was tortured to death by Akbar’ s successor for not altering the Adi Granth to remove passages that gave offense to Hinduism or Islam.

Arjuna \'3r-ju-n9\ One of the five brothers who are the heroes of the Mahabharata. His reluctance to go into battle prompts Krishna, manifested as his friend and charioteer, to deliver the discourse on duty that constitutes the Bhagavadgita. An exemplar of skill, duty, and compassion as well as a seeker of true knowledge, Arjuna is a central figure in Hindu myth and theology.

Ark of the Covenant In Judaism and Christianity, the ornate, gold-plated wooden chest that in biblical times housed the two tablets of the Law given to Moses by God. The Levites carried the Ark during the Hebrews' wandering in the wilderness. Following the conquest of Canaan, it was kept at Shiloh but was sometimes carried into battle by the Israelites. David took it to Jerusalem, and Solomon placed it in the Temple of Jerusalem, where it rested in the Holy of Holies and was seen only by the high priest on Yom Kippur. It is believed to have been captured when Jerusalem fell to the Babylonians in 586 bc, and its subsequent fate is unknown.

Arkansas State (pop., 2000: 2,673,400), south-central U.S. Bordered by Missouri, Tennessee, Mississippi, Louisiana, Texas, and Oklahoma, it covers 53,178 sq mi (137,730 sq km). Its capital is Little Rock, and its highest point is Mount Magazine, at 2,753 ft (839 m). The earliest inhabitants were Indian bluff dwellers along the Mississippi River c. ad 500. Mound-building cultures later left burial mounds along the river. Spanish and French explorers traversed the region in the 16th- 17th centuries; the first permanent European settlement was founded at Arkansas Post in 1686. Acquired by the U.S. as part of the Louisiana Purchase, Arkansas Territory was established in 1819; the state's current boundaries were fixed in 1828. Arkansas became the 25th state in 1836. It seceded in 1861 to join the Confederacy in the American Civil War; it was readmitted to the Union in 1868. Following Reconstruction, a rigid policy of segregation lasted until 1957, when court-ordered desegregation of the schools was implemented. Once dominated by agriculture, the state's economy now also includes mining and manufacturing. Tourism is promoted, especially by the mineral springs at Hot Springs National Park and resorts in the Ozark Mountains.

Arkansas River River, rising in central Colorado, U.S. At 1,450 mi (2,333 km) long, it flows east through southern Kansas and southeast across northeastern Oklahoma and bisects Arkansas, where it empties into the Mississippi River. Navigable for 650 mi (1,046 km), its largest tributaries are the Canadian and Cimarron rivers. It is believed to have been

crossed by Francisco Vazquez de Coronado in 1541 near the site of Dodge City, Kan., and by Zebulon Pike in 1806.

Arkhangelsk \,3r-'kan-gilsk\ or Archangel City (pop., 2002: 355,500), northwestern Russia. Located near the mouth of Northern Dvina River, it has a large harbour kept open in winter by icebreakers. The area was settled by Norsemen in the 10th century ad. In 1553 it was visited by the English who were looking for the Northeast Passage. Founded in 1584 as a monastery of Michael the archangel, it became a trading station of the Muscovy Co. It was opened to European trade by Tsar Boris Godunov and flourished as the sole Russian seaport until St. Petersburg was built in 1703. Arkhangelsk was the scene of British, French, and U.S. support of the northern Russian government against the Bolsheviks in

1918-20. During World War II it received convoys of lend-lease goods from Britain and the U.S. (1941-45). It is a major timber-exporting port and has extensive shipbuilding facilities.

Arkona W. Slavic citadel-temple of the war-god Svantovit, built in the 9th-10th century ad and destroyed in 1168/69 by Christian Danes when they stormed the island of Riigen in the southwestern Baltic. According to Saxo Grammaticus, it was a log structure with red roof, surrounded by a yard and fence, carved and painted with symbols. The inner sanctum contained a statue of Svantovit with four heads and throats facing in opposite directions. Excavations in 1921 proved the temple’s actual existence.

arkose \'ar-,kos, 'ar-,koz\ Coarse sandstone that has formed by the disintegration of granite without appreciable decomposition. It thus consists primarily of quartz and feldspar grains. In the absence of stratification, arkose may bear superficial resemblance to granite, and it sometimes has been described as reconstituted granite, or granite wash. Like the granite from which it was formed, arkose is pink or gray.

Arkwright, Sir Richard (b. Dec. 23, 1732, Preston, Lancashire, Eng. — d. Aug. 3, 1792, Cromford, Derbyshire) British textile industrialist and inventor. His first spinning machine was patented in 1769 (see Lewis Paul). His water frame (so-called because it operated by waterpower) produced a cotton yarn suitable for warp (see weaving), stronger than thread made on the spinning jenny, which proved suitable only for weft. He introduced all-cotton calico in 1773. He opened several factories equipped with machinery for carrying out the phases of textile manufacturing from carding through spinning (see drawing).

Arledge, Roone (b. July 8, 1931, Forest Hills, N.Y., U.S. — d. Dec. 5, 2002, New York City) U.S. television executive. He began work at ABC-TV in 1960 as a sports producer. He later became president of ABC Sports and group president of ABC News and Sports (1985-90). He created sports programs such as Wide World of Sports (from 1961) and Monday Night Football (from 1968) and produced television coverage of 10 Olympic games, making many technical and editorial innovations in sports coverage. As president of ABC News he developed several successful news shows such as Nightline (from 1980) and PrimeTime Live (from 1989).

Arlen, Harold orig. Hyman Arluck (b. Feb. 15, 1905, Buffalo, N.Y., U.S. — d. April 23, 1986, New York, N.Y.) U.S. songwriter. After working as a performer and arranger, in 1929 he began a collaboration with lyricist Ted Koehler (1894-1973) with the song “Get Happy”; until the mid- 1930s they wrote many songs that were featured in shows at Harlem’s Cotton Club. Arlen’ s scores for Broadway musicals include Bloomer Girl (1944) and St. Louis Woman (1946). For Hollywood films Arlen wrote the songs “It’s Only a Paper Moon,” “Let’s Fall in Love,” and “That Old Black Magic.” His most famous song is perhaps “Over the Rainbow” (lyrics by E.Y. Harburg) from The Wizard of Oz (1939).

Arles Varl, 'arlz\ City (pop., 1999: 50,453), southeastern France. Occupied and built up by the Romans in the 1st century bc, Arles became, through commerce, a leading city of the Roman Empire. In the 10th century ad it became the capital of Burgundy, known also as the kingdom of Arles. Portions of the Roman wall around the old town remain, and a Roman arena of the 1st century bc is still used for bullfights and plays. The city was home to Vincent van Gogh during one of his most produc-

tive periods. Arles is still a river port, but its economy is based largely on tourism and agriculture.

Arlington Unincorporated settlement (pop., 2000: 189,453), northern Virginia, U.S. Lying across the Potomac River from Washington, D.C., it is the capital of Arlington county, which was part of Washington, D.C., from 1801 to 1847, when it was returned to Virginia. It is the site of

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Arlington National Cemetery (located on the former estate of Robert E. Lee), Ronald Reagan Washington National Airport, and numerous federal buildings, including the Pentagon.

arm Upper limb of a biped, particularly a primate. Primate arms have one long bone, the humerus, in the upper arm above the elbow, and two thinner bones, the radius and ulna, in the forearm. The triceps muscle straightens the forearm at the elbow joint; the brachialis and biceps muscles bend it. Forearm and small muscles in the hand move the hand and fingers. The term may also denote the limb or the locomotive or prehensile organ of an invertebrate (e.g., the ray of a starfish or the tentacle of an octopus).

Armada, Spanish Great fleet sent by Philip II of Spain in 1588 to invade England in conjunction with a Spanish army from Flanders. Philip was motivated by a desire to restore the Roman Catholic faith in England and by English piracies against Spanish trade and possessions. The Armada, commanded by the duke of Medina-Sidonia, consisted of about 130 ships. In the weeklong battle, the Spanish suffered defeat after the English launched fire ships into the Spanish fleet, breaking the ships' formation and making them susceptible to the English ships' heavy guns. Many Spanish ships were also lost during the long voyage home, and a total of perhaps 15,000 Spaniards died. The defeat of the Armada, in which Francis Drake played a principal role, saved England and the Netherlands from possible absorption into the Spanish empire.

armadillo Any of 20 species of armoured mammals (family Dasypodidae) related to sloths and anteaters.

Armadillos are stout and short-legged, with strong, curved claws and a protective covering of pinkish to brown armour composed of bony plates covered with tough scales.

The plates are separated by flexible bands of tissue. One species lives in the U.S., the others in tropical and subtropical regions to the south, primarily in South America. Most

inhabit open areas, but some can be found in forests. Species range in size from about 6 in. (16 cm) to 5 ft (1.5 m) long. They live alone, in pairs, or in small groups and feed on termites or other insects, vegetation, small animals, and carrion.

Armageddon \,ar-m9-'ged-3n\ In the New Testament, the place where the kings of the earth under demonic leadership will wage war on the forces of God at the end of history. Armageddon is mentioned only in the Revelation to John. The name may mean “Mountain of Megiddo,” a reference to the city of Megiddo, which held strategic importance in Palestine. Other biblical references suggest Jerusalem as the battle site.

Armagh \'ar-,ma\ District (pop., 2001: 54,263), Northern Ireland. Formerly part of County Armagh, the district was established in 1973. It lies south of Lough Neagh. The northern part of the district is the island’s main fruit-growing region; the southern part, along the Irish border, was a hotbed of sectarian violence through the late 20th century. The district seat is Armagh town. According to tradition, St. Patrick established his principal Irish church here in the 5th century. The area was the leading intellectual centre of the Western world in the 5th-9th centuries. Taken by English Protestant forces in the 16th century, Armagh became a prosperous centre for Protestant clergy and gentry, a circumstance reflected in its many Georgian monuments and buildings.

Armagnac \,ar-ma-'nyak\ Small territory in historical Gascony, southwestern France. A portion was part of the Roman province of Aquitania (see Aquitaine). From c. 960 it was the separate countship of Armagnac, and it grew to occupy a buffer zone between lands controlled by the French kings (Toulouse) and those controlled by the English (Guyenne). It led the resistance to the English king Henry V’s invasion of France but suffered a setback at the Battle of Agincourt. It was first annexed to France in 1497, became a countship again, but finally, by descent through the rulers of Navarra, returned to the French crown in 1607. Again a countship from 1645, it was dissolved in 1789. The region produces the famous Armagnac brandy.

Armani \ar-'ma-ne\, Giorgio (b. July 11, 1934, Piacenza, Italy) Italian fashion designer. He abandoned medical school and worked as a buyer

for a department store (1957-64) before training as a fashion designer. In 1974-75 he introduced his own label of ready-to-wear apparel for men and women. In 1980-81 he founded Giorgio Armani USA, Emporio Armani, and Armani Jeans, and in 1989 he opened shops in London. He was a leader in the move toward a pared-down, unstructured silhouette in menswear and was responsible for the wide- shouldered look for executive women. His designs, often characterized by understated glamour and luxurious fabrics, introduced ease and streamlined modernity into late 20th-century dressing.

Armed Islamic Group French Groupe Islamique Armee (GIA) Algerian militant group. It was formed in 1992 after the government nullified the likely victory of the Islamic Salvation Front in 1991 legislative elections and was fueled by the repatriation of numerous Algerian Islamists who had fought in the Afghan War (1978-92). The GIA began a series of violent, armed attacks against the government and against foreigners in Algeria and has been accused of civilian massacres — although

it has been alleged that many such atrocities were committed by security-service infiltrators and special military units. It has also engaged in attacks abroad (particularly in France) and purportedly maintained links with militant Islamic groups throughout the world. Estimates of GIA strength have varied from hundreds to several thousand guerrillas.

Armenia officially Republic of Armenia Country, Transcaucasia, western Asia. Area: 1 1,484 sq mi (29,743 sq km). Population (2005 est.): 2,983,000. Capital: Yerevan. Armenians constitute nine-tenths of the popu-

dominantly Armenian Apostolic; also Roman Catholic); also Islam. Currency: dram. Armenia is a mountainous country with an average elevation of 5,900 ft (1,800 m). The Lesser Caucasus ranges stretch across its northern portion, and Lake Sevan lies in the east-central part. Armenia has a dry and continental climate that changes dramatically with elevation. Though the country has become highly industrialized (as a result of the development of hydroelectric power during Soviet rule) and increasingly urbanized, agriculture is still important. The Republic of Armenia is a successor state to a historical region in Caucasia. Historical Armenia’s boundaries have varied considerably, but old Armenia extended over what are now northeastern Turkey and the Republic of Armenia. The area was equivalent to the ancient kingdom of Urartu, which ruled c. 1270-850 bc. It was later conquered by the Medes (see Media) and Macedonia and still later allied with Rome. Armenia adopted Christianity as its national religion c. ad 300. For cen-

Nine-banded armadillo (Dasypus novemcinctus).

APPEL COLOR PHOTOGRAPHY

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turies the scene of strife among Arabs, Seljuqs, Byzantines, and Mongols, it came under the rule of the Ottoman Empire in 1514-16. Over the next centuries, as parts were ceded to other rulers, nationalism arose among the scattered Armenians; by the late 19th century it had caused widespread disruption. Fighting between Ottomans and Russians escalated when part of Armenia was ceded to Russia in 1828, and it continued through World War 1 (1914-18), leading to genocide against Armenians (see Armenian massacres). With the Ottoman defeat, the Russian portion became part of a Soviet republic in 1922. Armenia was established as a constituent republic of the U.S.S.R. in 1936. The U.S.S.R. began to dissolve in the late 1980s, and Armenia declared its independence in 1991. In the years that followed, it fought Azerbaijan for control of Nagorno-Karabakh, a conflict that continued despite attempts to settle it. Large numbers of Arme-

nians left the country in the 1990s following an economic downturn, and many stayed away even after the economy began to improve.

Armenia, Little See Little Armenia

Armenian Armenian Hay plural Hayk or Hayq Member of an Indo-European people first recognized in the early 7th century bc when they moved into areas of Transcaucasia, Anatolia, and the Middle East that came to be known as Armenia. Armenian history has been one of nearly constant struggles for independence from foreign domination, first from the Medes and Persians, the Seleucid dynasty, and the Roman Republic and Empire and later from the Byzantine Empire, the SeuGq dynasty, the Ottoman Empire, the Safavid dynasty, and tsarist Russia. At the beginning of the 20th century most Armenians were driven from Anatolia or killed by Ottoman forces during the Armenian massacres. The Republic of Armenia was declared in 1990 after being part of the Soviet Union since 1922. More than 3.5 million Armenians live there, and there is an appreciable diaspora in other countries of Transcaucasia, in parts of the Middle East, and in the West. Armenian culture reached an apex in the 14th century, producing highly regarded sculpture, architecture, and fine art. Until the 20th century, Armenians were primarily agricultural; now they are highly urbanized. Traditionally they are either Orthodox or Roman Catholic Christians; Armenia was considered the first Christian state.

Armenian language Indo-European language of the Armenians. It is spoken by perhaps five to six million people worldwide. Armenian has undergone phonetic and grammatical changes that make it completely distinct from other branches of Indo-European; its closest affinity may be with Greek, though this hypothesis has been vigorously disputed. Its long history of contact with Iranian languages has resulted in the adoption of many Persian loanwords. According to tradition, the unique Armenian alphabet was created by the cleric Mesrop Mashtots in ad 406 or 407. Armenian of the 5th-9th centuries (Grabar, or Classical Armenian) was employed as the literary language into modern times. A 19th-century cultural revival led to the formation of two new literary languages: West Armenian, based on the speech of Istanbul Armenians, and East Armenian, based on the speech of Transcaucasian Armenians. Because of a long tradition of emigration and the massacres and expulsions during the last decades of Ottoman rule, most speakers of West Armenian live outside Anatolia. East Armenian is the language of the present-day Republic of Armenia.

Armenian massacres Murder and expulsion of Turkish Armenians by the Ottoman Empire under Abdulhamid II in 1894-96 and by the Young Turk government in 1915-16. In 1894, when the Armenians began agitating for territorial autonomy and protesting against high taxes, Ottoman troops and Kurdish tribesmen killed thousands. In 1896, hoping to call attention to their plight, Armenian revolutionaries seized the Ottoman Bank in Istanbul. Mobs of Muslim Turks, abetted by elements of the government, killed more than 50,000 Armenians in response. Sporadic killings occurred over the next two decades. In response to Russia’s use of Armenian troops against the Ottomans in World War I (1914-18), the government deported 1.75 million Armenians south to Syria and Mesopotamia, in the course of which some 600,000 Armenians were killed or died of starvation.

Armenian Secret Army to Liberate Armenia See ASALA

Armistice (Nov. 11, 1918) Agreement between Germany and the Allies

ending World War I. Allied representatives met with a German delegation in a railway carriage at Rethondes, France, to discuss terms. The agreement was signed on Nov. 11, 1918, and the war ended at 11:00 am that day (“the 11th hour of the 11th day of the 11th month”). The principal term was that Germany would evacuate Belgium, France, and Alsace-Lorraine. Negotiations formalizing the armistice were conducted

at the Paris Peace Conference. Later a “stab in the back” legend developed in Germany, asserting that the German military situation had not been hopeless and that traitorous politicians had done the Allies’ bidding by signing the Armistice.

Armory Show formally International Exhibition of Modern

Art Exhibition of painting and sculpture held in 1913 at the 69th Regiment Armory in New York City. Conceived by its organizers, the Association of American Painters and Sculptors, as a selection of works exclusively by U.S. artists, it evolved into a comprehensive look at current European art movements, due in part to the advanced vision of association president Arthur B. Davies. Of the 1,300 works assembled, one-third were European, tracing the evolution of modern art from Francisco de Goya to Marcel Duchamp and Vasily Kandinsky, with works representative of Impressionism, Symbousm, Post- Impressionism, Fauvism, and Cubism. Perhaps the most controversial work was Duchamp’s nearly abstract Nude Descending a Staircase, No. 2 (1912). The U.S. artists featured were mainly members of the Ash Can school and The Eight. The show exposed the American public for the first time to advanced European art; American art suffered by contrast. The exhibition traveled to Chicago and Boston, establishing itself as a decisive event in the development of U.S. art and art collecting.

armour or body armour Protective clothing that can shield the wearer from weapons and projectiles. By extension, armour is also protective covering for animals, vehicles, and so on. Prehistoric warriors used leather hides and helmets. Chinese warriors used rhinoceros skin in the 11th century bc, and Greek infantry wore thick, multilayered metal-and-linen cuirasses (armour covering the body from neck to waist) in the 5th century bc. Shirts of chain mail were worn throughout the Roman Empire, and mail was the chief armour of western Europe until the 14th century. Ancient Greeks and Romans used armour made of rigid metal plates, which reappeared in Europe around the 13th century. Plate armour dominated European design until the 17th century, when firearms began to make it obsolete. It began to disappear in the 18th century, but the helmet reappeared in World War I and became standard equipment. Modern body armour (the bulletproof vest) covers the chest and sometimes the groin; it is a flexible garment reinforced with steel plates, fibreglass, boron carbide, or multiple layers of synthetic fabric such as Kevlar.

helmet

MERRIAM-WEBSTER INC.

Armour, Philip Danforth (b. May 16, 1832, Stockbridge, N.Y.,

U.S. — d. Jan. 6, 1901, Chicago, 111.) U.S. entrepreneur and innovator. Armour's first entrepreneurial success was in California mining endeavours. He vastly expanded his family's Midwestern grain and meatpack-

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ing business in 1875, originating the use of byproducts and the sale of canned meat. When railcar refrigeration was introduced in the 1880s (see Gustavus Franklin Swift), he established distributing plants in eastern states and began exporting Armour meat products to Europe. His Armour & Co. enterprises helped make Chicago the meatpacking capital of the world.

armoured vehicle Motor vehicle with plating for protection against bullets, shells, or other projectiles that moves on wheels or tracks. The tank is the chief armoured vehicle for larger military forces. Other military types include infantry fighting vehicles, amphibious landing vehicles, and mobile weapons platforms such as self-propelled artillery and anti-aircraft guns. Infantry fighting vehicles, descended from the armoured personnel carriers of World War II and the Vietnam War, are armoured, tracked vehicles that transport infantry into battle but also serve as platforms from which soldiers can fight without dismounting. Armoured cars are wheeled civilian vehicles, ranging from commercial trucks to luxury sedans, that generally are equipped with armour and other amenities for securely transporting valuables and individuals over paved roads.

armoury practice Production system for the assembly of finished products, in this case arms. With the adoption of the Model 1842 musket, the U.S. military achieved the large-scale assembly of weapons from uniform, interchangeable parts. By the mid- 1850s arms makers around the world were beginning to copy this American System of manufacture, which contributed to the creation of the modem military small arm, especially after the introduction of percussion ignition and rifled barrels.

arms control Limitation of the development, testing, production, deployment, proliferation, or use of weapons through international agreements. Arms control did not arise in international diplomacy until the first Hague Convention (1899). The Washington Conference (1921-22) and the Kellogg-Briand Pact (1928) were broken without much fear of sanction. U.S. -Soviet treaties to control nuclear weapons during the Cold War were taken more seriously. In 1968 the two superpowers and Britain sponsored the Nuclear Non-proliferation Treaty (signed also by 59 other countries), which committed signatory countries not to promote the spread, or proliferation, of nuclear weapons to countries that did not already possess them. See also Nuclear Test-Ban Treaty; Strategic Arms Limitation Talks; Strategic Arms Reduction Talks.

Armstrong, Edwin H(oward) (b. Dec. 18, 1890, New York, N.Y., U.S. — d. Jan. 31/Feb. 1, 1954, New York City) U.S. inventor. He studied at Columbia University, where he devised a feedback circuit that brought in signals with a thousandfold amplification (1912). At its highest ampli-

fication, the circuit shifted from being a receiver to being a primary generator of radio waves, and as such it is at the heart of all radio and television broadcasting. It earned him the Franklin Medal, the highest U.S. scientific honour. His 1933 invention of circuits that produced the carrier waves for frequency modulation (FM) made high-fidelity broadcasting possible.

Armstrong, Gillian (b. Dec. 18, 1950, Melbourne, Austl.) Australian film director. She first garnered international acclaim as the director of My Brilliant Career (1979), a feminist film about a young woman aspiring to be a writer in Victorian-era Australia. Her subsequent works include Australian films such as The Last Days of Chez Nous (1993) and Oscar and Lucinda (1997), as well as U.S. films such as Mrs. Soffel (1984), Little Women (1994), and Charlotte Gray (2001).

Armstrong, Lance (b. Sept. 18, 1971, Plano, Texas, U.S.) American cyclist and the first rider to win seven Tour de France titles (1999-2005). Armstrong began his professional cycling career in 1992 when he joined the Motorola team. He won stages of the Tour de France in 1993 and 1995 but withdrew from three of four Tours he attempted from 1993 to 1996. After the 1996 Tour, Armstrong fell ill, suffering from testicular cancer that had spread to his lungs and brain. Months of treatments followed before he could attempt his comeback. In 1998 he won the Tour of Luxembourg, and on July 25, 1999, he became the second American to win the Tour de France and the first to win it for an American team (three-time winner Greg LeMond had raced with European teams). In 2003 Armstrong won his fifth consecutive Tour de France, tying a record set by Miguel Indurain, and the following year he broke the record with his sixth consecutive win. After winning his seventh Tour in 2005, Armstrong announced his retirement.

Armstrong, Louis (b. Aug. 4, 1901, New Orleans, La., U.S. — d. July 6, 1971, New York, N.Y.) U.S. jazz trumpeter and singer. As a youth in New Orleans, he participated in marching, riverboat, and cabaret bands. A childhood nickname, Satchelmouth, was shortened to Satchmo and used throughout his life. In 1922 he moved to Chicago to join King Oliver’s Creole Jazz Band (see Dixieland). In 1924 he joined the Fletcher Henderson Orchestra in New York City; the following year he switched from cornet to trumpet and began recording under his own name with his Hot Five and Hot Seven ensembles. In these recordings the prevailing emphasis on collective improvisation gives way to his developing strength as soloist and vocalist. By the time of his “West End Blues” (1928), Armstrong had established the preeminence of the virtuoso soloist in jazz. His vibrant melodic phrasing, inventive harmonic improvisation, and swinging rhythmic conception established the vernacular of jazz music. His powerful tone, great range, and dazzling velocity set a new technical standard. He also was one of the first scat singers, improvising nonsense syllables in the manner of a horn. He became something more than a jazz musician: solo attraction, bandleader, film actor, and international star.

Arndt, Ernst Moritz (b. Dec. 26, 1769, Schoritz bei Gartz, Swed. — d. Jan. 29, 1860, Bonn, Ger.) Swedish-born German prose writer, poet, and patriot. He rejected the Lutheran ministry at age 28 and eventually became a professor of history at Greifswald and Bonn. Among his important works is the huge Spirit of the Times, 4 vol. (1806-18), a bold call for political reforms that expressed German national awakening during the Napoleonic era. Not all of Arndt's poems were inspired by political ideas; Gedichte (1804-18) contains many religious poems of great beauty.

Arne, Thomas Augustine (b. March 12, 1710, London, Eng. — d. March 5, 1778, London) British composer. Son of a London upholsterer, he secretly taught himself instrumental skills and composition with the help of an opera musician. Smitten by the opera, he had an early success with his own first opera, Rosamond (1733), and thereafter concentrated almost exclusively on the theatre. As composer to Drury Lane Theatre and London's great pleasure gardens, he became Britain's leading theatrical composer and, after George Frideric Handel, possibly the finest British composer of the century. Of his approximately 90 theatrical works, the best known are Comus (1738), The Judgment of Paris (1740), and Artaxerxes (1762). His song "Rule, Britannia" became an unofficial national anthem. His sister Susannah (1714-66) was the famous singer and actress known as Mrs. Cibber.

Louis Armstrong.

AP/WIDE WORLD PHOTOS

Armstrong, Neil (Alden) (b. Aug. 5, 1930, Wapakoneta, Ohio, U.S.) U.S. astronaut. He became a pilot at 16, studied aeronautical engineering, and won three Air Medals in the Korean War. In 1955 he became a civilian research pilot for the forerunner of NASA. He joined the space program in 1962 with the second group of astronauts. In 1966, as command pilot of Gemini 8, he and David Scott completed the first manual space docking maneuver, with an unmanned Agena rocket. On July 20, 1969, as part of the Apollo 1 1 mission, he became the first person to step onto the Moon, proclaiming "That's one small step for [a] man, one giant leap for mankind."

army Large, organized force armed and trained for war, especially on land. The term may be applied to a large unit organized for independent action or to a nation's or ruler's overall military organization for land warfare. The character and organization of armies have varied through history. At various times armies have been

built around infantry soldiers or mounted warriors (e.g., cavalry) or men in machines, and have been made up of professionals or amateurs, of mercenaries fighting for pay or for plunder, or of patriots fighting for a cause. See also AIR FORCE, CONSCRIPTION, GUERRILLA, MILITARY UNIT, MIUTIA, U.S. ARMY.

Neil Armstrong, 1 969.

NASA

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Arnhem Var-narrA Land Region, northeastern Northern Territory, Australia. It extends south from Van Diemen Gulf to the Gulf of Carpentaria and Groote Eylandt. Never fully explored, it has a total area of about 37,000 sq mi (96,000 sq km) and contains important bauxite and uranium mines. Occupied by Australian Aboriginals since the late Pleistocene, it was visited in 1623 by the Dutch explorer Jan Carstensz, who named it for his ship. The name now primarily refers to its large Aboriginal reserve.

Arnim, Bettina von orig. Elisabeth Katharina Ludovica Magdalena Brentano (b. April 4, 1785, Frankfurt am Main

[Germany] — d. Jan. 20, 1859, Berlin) German writer. Her best-known works are reworked records of her correspondence with Johann Wolfgang von Goethe, Karoline von Gtinderode, and her brother Clemens Brentano, much of it fictitious but written in a brilliantly vivid, uninhibited style.

Arno River River, central Italy. It is 150 mi (240 km) long, flowing west from the Apennines through Florence and into the Ligurian Sea below Pisa. Near Arezzo it is connected with the Tiber River by its canalized tributary, the Chiani. Subject to disastrous floods, in 1966 it inundated Florence and caused extensive damage.

Arnold, Benedict (b. Jan. 14,

1741, Norwich, Conn. — d. June 14,

1801, London, Eng.) American army

officer and traitor. He joined the American Revolutionary army in 1775 and contributed to American victories at the Battle of Ticonderoga, at Fort Stanwix, N.Y., and at the Battle of Saratoga, where he was seriously wounded. He was made a major general and placed in command of Philadelphia, where he lived extravagantly and socialized with wealthy loyalist sympathizers, one of whom he married in 1779. Reprimanded for fiscal irregularities in his command, he began secret overtures to the British. After receiving command of the fort at West Point, N.Y.

(1780), he offered to surrender it to the British for £20,000. The plot was uncovered after his British contact,

John Andre, was captured. Arnold escaped on a British ship to England, where he died penniless.

Arnold, Henry (Harley) known as Hap Arnold (b. June 25, 1886, Gladwyne, Pa., U.S. — d. Jan. 15, 1950, Sonoma, Calif.) U.S. air force officer. He attended West Point and initially served in the infantry. Volunteering as a flyer, he received instruction from Orville Wright. After World War I, with Billy Mitchell he became an eloquent advocate of an expanded air force. He rose through the ranks of the U.S. Army Air Corps to become its commander in 1938, and he commanded the Army Air Forces worldwide during World War II, overseeing a massive buildup and greatly influencing air bombardment strategy. He was named general of the army in 1944 and, after the National Defense Act of 1947 created an independent Air Force, general of the Air Force.

Arnold, Matthew (b. Dec. 24, 1822, Laleham, Middlesex, Eng. — d. April 15, 1888, Liverpool) English poet and literary and social critic. Son of the educator Thomas Arnold, he attended Oxford and then worked as an inspector of schools for the rest of his life. His verse includes “Dover Beach,” his most celebrated work; “Sohrab and Rustum,” a romantic epic; and “The Scholar Gipsy” and “Thyrsis.” Culture and Anarchy (1869), his central work of criticism, is a masterpiece of ridicule as well as a search-

ing analysis of Victorian society. In a later essay, “The Study of Poetry,” he argued that, in an age of crumbling creeds, poetry would replace religion and that therefore readers would have to understand how to distinguish the best poetry from the inferior.

Arnold, Thomas known as Doctor Arnold (b. June 13, 1795, East Cowes, Isle of Wight, Eng. — d. June 12, 1842, Rugby, Warwickshire)

British educator. A classical scholar, he became headmaster in 1828 of Rugby School, which was in a state of decline. He revived Rugby by

reforming its curriculum, athletics program, and social structure (in the prefect system he introduced, older boys served as house monitors to keep discipline among younger boys), becoming in the process the preeminent figure in British education. In 1841 he was named Regius Professor of Modern History at Oxford. In addition to several volumes of sermons, he wrote a three-volume History of Rome (1 838 — 43).

He was the father of Matthew Arnold and grandfather of the novelist Mrs.

Humphry Ward (1851-1920).

Arnolfo di Cambio (b. c. 1245,

Colle di Val d'Elsa— d. 1301/10,

Florence) Italian sculptor and architect active in Florence. He studied under Nicola Pisano and assisted him on the pulpit for Siena Cathedral (1265-68). In 1277 he went to Rome, where he worked for Charles of Anjou, king of Sicily. He also designed and constructed monuments, including the tomb of Cardinal de Braye in San Domenico, Orvieto. In 1296 Arnolfo returned to Florence to undertake his most important commission, the design of the Duomo (the cathedral of Florence) and the carving of statues for its facade. Other buildings in Florence attributed to him include the Palazzo Vecchio and the church of Santa Croce. The structural and decorative elements of Santa Croce and the Duomo have a unity, balance, and a lightness of movement that demonstrate Arnolfo's complete mastery of the late 13th-century Gothic architectural vocabulary. His works embody the transition between the late Gothic and Renaissance architectural sensibilities.

Arnulf (d. Dec. 8, 899) King of Germany. Originally duke of Carinthia, he was elected king of the eastern Franks in 887, deposing his uncle, Charles the Fat. The western Franks, Burgundy, and Italy refused to recognize Arnulf, thus dividing the Carolingian empire. He defeated the Vikings (891), ending their raids up the Rhine River, and maintained control of Lotharingia (now Lorraine). He invaded Italy at the urging of Pope Formosus, captured Rome (895), and was crowned emperor in 896. Illness forced him to return to Germany, however, and the previous emperor continued to rule. Arnulf s last years saw invasions by Magyars and Slavs and the collapse of his power.

aromatherapy Therapy using essential oils and water-based colloids extracted from plant materials to promote physical, emotional, and spiritual health and balance. Single or combined extracts may be diffused into inhaled air, used in massage oil, or added to bathwater. Inhaled molecules of these extracts stimulate the olfactory nerve, sending messages to the brain's limbic system (the seat of memory, learning, and emotion) that are said to trigger physiological responses (e.g., eucalyptus relieves congestion, lavender promotes relaxation). Mainstream medical practitioners question the claim of independent physiological effects; they consider many of the benefits more likely due to the conditioned responses that

odors can reinforce or help create. The oils and solutions used have been shown to have certain effects but are not standardized. The few risks involved include allergic reactions.

aromatic compound Any of a large class of organic compounds whose molecular structure includes one or more planar rings of atoms, usually but not always six carbon atoms. The ring’s carbon-carbon bonds (see bonding) are neither single nor double but a type characteristic of these compounds, in which electrons are shared equally with all the atoms around the ring in an electron cloud. The term was first applied c. 1860

Bettina von Arnim, engraving after Armgass von Arnim's copy of a miniature by an unknown artist.

COURTESY OF THE TRUSTEES OF THE BRITISH MUSEUM; PHOTOGRAPH, J.R. FREEMAN & CO. LTD.

Benedict Arnold, engraving by H.B. Hall, 1 865.

LIBRARY OF CONGRESS, WASHINGTON, D.C.

Thomas Arnold, detail of an engraving by H. Cousins, 1 840, after an oil painting by Thomas Philips.

COURTESY OF THE TRUSTEES OF THE BRITISH MUSEUM; PHOTOGRAPH, J.R. FREEMAN & CO. LTD.

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to a class of hydrocarbons isolated from coal tar and distinguished by odours much stronger than those of other classes of hydrocarbons. In modern chemistry, aromaticity denotes the chemical behaviour, especially the low reactivity, of this class of molecules related to their bonding. The parent compound of this class is benzene (C 6 H 6). See also hydrogenation.

Aron \ar-'o n \, Raymond (-Claude-Ferdinand) (b. 1905 — d. 1983) French sociologist and historian. After receiving his doctorate from the Ecole Normale Superieure (1930), he taught at the University of Toulouse until 1939. During World War II he joined the Free French and edited

their newspaper (1940^44). He later taught at the Ecole Nationale d’ Administration, the Sorbonne, and the College de France. He was also a columnist for Le Figaro (1947-77) and L’ Express (1977-83). Aron upheld a rationalist humanism that was often contrasted with the Marxist existentialism of his great contemporary and former classmate Jean- Paul Sartre. A continuing theme in his writings was the subject of violence and war.

Aroostook \3-'ru-stuk\ War (1838-39) Bloodless conflict over the disputed boundary between the U.S. state of Maine and the British Canadian province of New Brunswick. As settlers from both countries moved into the disputed Aroostook area, officials and bands of men from both sides made arrests and took prisoners of “trespassers.” In 1839 U.S. and Canadian troops were ordered to the area. A truce allowed joint occupancy of the territory until 1842, when a satisfactory settlement was reached.

Arp, Jean known as Hans Arp (b. Sept. 16, 1887, Strassburg, Ger. — d. June 7, 1966, Basel, Switz.) French painter, sculptor, and poet. After studying in Weimar, Ger., and at the Academie Julian in Paris, he became involved in the most important movements of early 20th-century art: Der Blaue Reiter in Munich (1912), Cubism in Paris (1914), Dada in Zurich during World War I, Surrealism (1925), and Abstraction-Creation (1931). During these years he produced polychrome relief carvings in wood, cut-paper compositions, and, in the 1930s, his most distinctive sculptural works: abstract forms that suggest animals and plants. He also wrote poetry.

Arrabal \,ar-ra-'bal\, Fernando (b. Aug. 11, 1932, Melilla, Spanish Morocco) Spanish French Absurdist playwright, novelist, and filmmaker. He turned to writing in the 1950s, and in 1955 he began studying drama in Paris, where he remained. His early plays, in particular Picnic on the Battlefield , brought him to the attention of the French avant-garde. After the mid 1960s his plays evolved into what he termed Theatre Panique (“Panic Theater”); typical of this period is And They Put Handcuffs on the Flowers. His dramatic and fictional world is often violent, cruel, and pornographic.

arrastra \9-'ras-tro\ Drag-stone mill for pulverizing ores to isolate silver by the patio process, apparently used in pre-Columbian America. The silver ore was crushed and ground by mule power in the arrastras (shallow circular pits paved with stone). Large blocks of stone attached by beams to a central rotating post were dragged around the arrastra, reducing the ore to a fine mud. Further steps resulted in the isolating of the silver.

arrest Restraint and seizure of a person by someone (e.g., a police officer) acting under legal authority. An officer may arrest a person who is committing or attempting to commit a crime in the officer’s presence. Arrest is also permitted if the officer reasonably believes that a crime has been committed and that the person arrested is the guilty party. A court or judicial officer may issue an arrest warrant on a showing of probable cause. Most states restrict or prohibit arrest in civil (noncriminal) cases; an example of occasionally permitted civil arrest is the taking into custody of a debtor who might otherwise abscond. In the U.S., suspects must be warned of their rights when they are arrested (see Miranda v. Arizona). An unlawful arrest is regarded as false imprisonment and usually invalidates any evidence collected in connection with it. See also rights of the accused; grand jury; indictment.

Arrhenius \ar-'a-ne-9s\, Svante (August) (b. Feb. 19, 1859, Vik, Swed. — d. Oct. 2, 1927, Stockholm) Swedish physical chemist. His theories on dissociation of substances in solution into electrolytes or ions, first published in 1884 as his Ph.D. thesis, were initially met with skepticism, but increasing recognition abroad gradually won over the opposition in Sweden. He also did important work on reaction rates; the equation describing the dependence of reaction rates on temperature is often called the Arrhenius law, and he was the first to recognize the greenhouse effect. After receiving the Royal Society of London's Davy Medal (1902), he became in 1903 the third recipient of the Nobel Prize for Chemistry. He is regarded as one of the founders of the field of physical chemistry.

arrhythmia \a-'rith-me-3\ Variation from the heartbeat' s normal rate or rhythm, caused by problems in the heart's pacemaker or in nerves conducting its signals. Occasional arrhythmias are normal. Tachycardia is a fast regular rhythm; bradycardia is a slow rhythm. Premature atrial or ventricular beats are extra contractions in normal rhythm. Ongoing arrhythmia in some heart diseases can reduce the heart's ability to supply the body with blood and can lead to heart failure. Severe arrhythmias can trigger atrial fibrillation or ventricular fibrillation. Arrhythmias are detected by electrocardiography and treated by electric shock (often with an implanted pacemaker) or by drugs such as quinidine and digitalis.

arrow See bow and arrow

Arrow, Kenneth J(oseph) (b. Aug. 23, 1921, New York, N.Y., U.S.) U.S. economist. He received his Ph.D. from Columbia University and taught principally at Stanford and Harvard. Arrow's books include Social Choices and Individual Values (1951). His most striking claim was that, under certain conditions of rationality and equality, a ranking of societal preferences will not necessarily correspond to the rankings of individual preferences, given more than two individuals and alternative choices. In 1972 he shared the Nobel Prize with John R. Hicks.

Arrow War See Opium Wars

arrowroot Any of several plant species of the genus Maranta (family Marantaceae), whose rhizomes yield an edible starch. Chief among these is the herbaceous perennial M. arundinacea, the source of genuine, or West Indies, arrowroot. The powder obtained from the harvested roots is almost pure starch; it is used in cookery as a thickener. Arrowroot is easily digested and is used in diets requiring bland, low-salt, and low-protein foods. Its name is sometimes applied to starches obtained from other plants and used as substitutes for true arrowroot. Brazilian arrowroot, from the cassava plant, is the source of tapioca.

Ars Antiqua Vars-an-'te-kw3\ Latin "Ancient Art" Musical style of 13th-century France. The term was derived retrospectively to distinguish 13th-century music from that of the 14th century (Ars Nova). It is partly characterized by use of the six rhythmic modes, each being a rhythmic pattern that would recur throughout a piece, such as long-short (first mode) or short-long (second). Akin to the “feet” of poetry (see prosody), the relative lengths of long and short depended on the mode. The system broke down as composers began to use subdivisions of the short note. The musical genres of the Ars Antiqua included organum and the early motet.

Ars Nova \'ars-'no-v3\ Latin "New Art" Musical style of 14th-century Europe, particularly France. As composers began to use ever shorter notes in their music, the old system of rhythmic modes (see Ars Antiqua) ceased to be adequate to describe it. In his treatise Ars nova (1323), Philippe de Vitry (1291-1361) proposed a way of relating longer and shorter notes by a metrical scheme — the ancestor of time signatures — whereby each note value could be subdivided into either two or three of the next-shorter note. Though seemingly abstract, this innovation had a marked effect on the sound of music because composers were better able to control the relative motion of several voices, and 14th-century music consequently sounds much less “medieval” to modern ears. De Vitry and Guillaume de Machaut are the principal composers of the Ars Nova. The term is sometimes extended to describe all 14th-century music, including that of Italy. See also formes fixes.

Arsacid \ar-'sas-id\ dynasty (247 bc-ad 224) Persian dynasty. It was founded by Arsaces (r. c. 250-211? bc) of the Parni tribe, which originally dwelt east of the Caspian Sea and entered Parthia after the death of Alexander the Great (323 bc), gradually extending control southward. Arsacid power reached its peak under Mithradates I (r. 171-138 bc). The

Svante Arrhenius, 1918.

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government was influenced by that of the Seleucid dynasty and tolerated the formation of vassal kingdoms. The dynasty legitimized its rule over former Achaemenian territories by claiming descent from the Achaemenian king Artaxerxes II. It controlled trade routes between Asia and the Greco-Roman world and used its resultant wealth to erect many buildings. The dynasty was overthrown in 224 by the Sasanian dynasty.

arsenic poisoning Harmful

effects of arsenic compounds (in pesticides, chemotherapy drugs, paints, etc.), most often from insecticide exposure. Susceptibility varies. Arsenic is believed to combine with certain enzymes, interfering with cellular metabolism. Symptoms of acute arsenic poisoning include nausea and abdominal pain followed by circulatory collapse. Acute exposure to the gas arsine causes destruction of red blood cells and kidney damage; chronic exposure causes weakness, skin disorders, anemia, and nervous-system disorders. Arsenic in urine and hair or nails is the key to diagnosis. Treatment involves washing out the stomach and promptly administering the antidote dimercaprol.

arson Crime commonly defined by statute as the unlawful damage or destruction of property by means of fire or explosion. In nearly all countries (except Great Britain) an arsonist is guilty of murder if someone dies as a result of his action, even if he did not intend to kill. Germany and some U.S. states also impose serious penalties for arson when it is committed to conceal or destroy evidence of another crime. Although fire caused by accident or ordinary carelessness is not arson, a person may be guilty of arson if he causes a fire in reckless disregard of the consequences of his actions.

art also called visual art A visual object or experience consciously created through an expression of skill or imagination. The term art encompasses diverse media such as painting, sculpture, printmaking, drawing, decorative arts, photography, and installation. The various visual arts exist within a continuum that ranges from purely aesthetic purposes at one end to purely utilitarian purposes at the other. This should by no means be

taken as a rigid scheme, however, particularly in cultures in which everyday objects are painstakingly constructed and imbued with meaning. Particularly in the 20th century, debates arose over the definition of art. Figures such as Dada artist Marcel Duchamp implied that it is enough for an artist to deem something “art” and put it in a publicly accepted venue. Such intellectual experimentation continued throughout the 20th century in movements such as conceptual art and Minimalism. By the turn of the 21st century, a variety of new media (e.g., video art) further challenged traditional definitions of art. See aesthetics; art conservation and restoration; drawing; painting; printmaking; sculpture; photography; decorative arts.

art brut \,art-'brut, ar-'brCet\ French "raw art" Art produced by people outside the established art world, particularly crude, inexperienced, or obscene works created by the untrained or the mentally ill. The term was coined by Jean Dubuffet, who regarded such works as the purest form of expression. See also naive art.

art collection Works of art accumulated by an individual or institution. Such collections were made in the earliest civilizations; precious objects were stored in temples, tombs, sanctuaries, and palaces. A taste for collecting per se developed in Greece (4th– 1 st century bc). The great art collections of the world grew out of private collections formed by royalty, aristocracy, and the wealthy. By the 18th century, collectors were donating their holdings to the public and constructing buildings to house them (e.g., the Louvre Museum, Uffizi Gallery). Wealthy industrialists in the U.S. played a prominent role in the 19th-20th century, and an unprecedented flow of masterpieces from Europe soon filled U.S. museums.

art conservation and restoration Maintenance and preservation of works of art, their protection from future damage, deterioration, or neglect, and the repair or renovation of works that have deteriorated or been damaged. Research in art history has relied heavily on 20th- and 21st-century technical and scientific advances in art restoration. Modern conservation practice adheres to the principle of reversibility, which dictates that treatments should not cause permanent alteration to the object.

art criticism Description, interpretation, and evaluation of works of art, manifested in journal reviews, books, and patronage. Art criticism encompasses a wide variety of approaches, from critical commentary to more subjective emotional reactions inspired by viewing works of art. Art criticism as a distinct discipline developed parallel to Western aesthetic theory, beginning with antecedents in ancient Greece and fully taking form in the 18th and 19th centuries. In the 20th century perceptive critics became champions of new artistic movements. Beginning in the 20th and continuing into the 21st century, many critics used social and linguistic, rather than aesthetic, theoretical models. Prominent art critics include Roger Fry, Clive Bell, Clement Greenberg, Harold Rosenblum, Lawrence Alloway, Rosalind Krauss, and Donald Kuspit. See also aesthetics.

Art Deco V.art-'de-ko, ,ar-da-'ko\ or Style Moderne Vstel-mo-'denA Movement in design, interior decoration, and architecture in the 1920s and ’30s in Europe and the U.S. The name derives from the Exposition Internationale des Arts Decoratifs et Industriels Modernes in Paris in 1925. Its products included both individually crafted luxury items and mass-produced wares, but, in either case, the intention was to create a sleek and antitraditional elegance that symbolized wealth and sophistication. Influenced by Art Nouveau, Bauhaus, Cubist, Native American, and Egyptian sources, the distinguishing features of the style are simple, clean shapes, often with a “streamlined” look; ornament that is geometric or stylized from representational forms; and unusually varied, often expensive materials, which frequently include man-made substances (plastics, especially bakelite; vita-glass; and ferroconcrete) in addition to natural ones (jade, silver, ivory, obsidian, chrome, and rock crystal). Typical motifs included stylized animals, foliage, nude female figures, and sun rays. New York City’s Rockefeller Center (especially its interiors supervised by Donald Deskey), the Chrysler Building by William Van Alen, and the Empire State Building by Shreve, Lamb & Harmon are the most monumental embodiments of Art Deco.

Art Ensemble of Chicago U.S. jazz ensemble. The group evolved from the Association for the Advancement of Creative Musicians (AACM), an experimental collective. Saxophonists Roscoe Mitchell and Joseph Jarman, trumpeter Lester Bowie, bassist Malachi Favors, and drummer Don Moye formed the group in 1969, combining freely changing tempos, dynamics, and textures with an often comic theatricality of presentation. Their diversity of inspiration is expressed by their motto, “Great Black Music: Ancient to the Future.”

arsenic Nonmetallic to semimetallic chemical element, chemical symbol

As, atomic number 33. It exists uncombined in two stable (and several unstable) allotropes, one gray

and one yellow, but is more often found in nature as the sulfide or oxide. The elemental form is used to form alloys of metals (especially lead), and certain semiconductors are made from crystals of gallium arsenide (GaAs). Arsenious oxide (arsenic trioxide or white arsenic, As 2 0 3) is used in pesticides, as a pigment, and as a preservative of hides and wood; this is the poisonous “arsenic” (see arsenic poisoning) in detective stories. Arsenic pentoxide (As 2 0 5) is also used in insecticides, herbicides, metal adhesives, and pigments.

Arsenic (gray) with realgar (red) and orpiment (yellow)

BY COURTESY OF THE JOSEPH AND HELEN GUETTERMAN COLLECTION; PHOTOGRAPH, JOHN H. GERARD

Arsinoe \ar-'sin-o-e\ II (b. c. 316 — d. July 270 bc) Queen of Thrace (300-281) and Egypt (277-270).

Daughter of Ptolemy I Soter, she married the king of Thrace (300) and tried to have her son made heir instead of Agathocles, the king’s son by an earlier marriage. Agathocles sought help from Seleucids, causing a war in which Arsinoe’ s husband was killed in battle. Her half brother, who took power in Thrace and Macedonia, cajoled her into marrying him and then promptly killed her two younger sons. She fled to Alexandria, ousted the wife of her brother Ptolemy II, and married him (c. 277); Arsinoe II, coin, 270-250 bc; in the like the pharaohs, the two were British Museum called “Philadelphoi” (“Sibling- BY courtesy OF THE trustees OF THE BRITISH museum Loving”). She wielded great power

and shared many honours with Ptolemy, including deification while alive.

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art history Historical study of the visual arts for the purpose of identifying, describing, evaluating, interpreting, and understanding art objects and artistic traditions. Art-historical research involves discovering and collecting biographical data on artists to establish attribution; determining at what stage in a culture’s or artist’s development an object was made; weighing the influence the object or artist had on the historical past; and documenting an object’s previous whereabouts or ownership (provenance). The analysis of symbols, themes, and subject matter is often of primary concern. In the 20th and 21st centuries art historians became increasingly concerned with the social and cultural context of artists and their work.

Art Institute of Chicago Museum in Chicago that houses European, American, Asian, African, and pre-Columbian art. It was established in 1866 as the Chicago Academy of Design and took its current name in 1882. In 1893 it moved to its present building, designed by the architectural firm of Shepley, Rutan, and Coolidge for the World’s Columbian Exposition, on Michigan Avenue. The Art Institute, which comprises both a museum and a school, is noted for its extensive collections of 19th-century French painting (Impressionist works and the work of Claude Monet in particular) and 20th-century European and American painting. Among its best-known works are Georges Seurat’s A Sunday Afternoon on La Grand Jatte — 1884 (1884-86), Grant Wood’s American Gothic (1930), and Edward Hopper’s Nighthawks (1942).

Art Nouveau \,art-nu-'v6, .ar-nii-'voX Decorative style that flourished in western Europe and the U.S. c.

1890-1910. The term was derived in 1895 from a gallery in Paris called L’Art Nouveau. Characterized by sinuous, asymmetrical lines based on plant forms, the style was used in architecture, interior design, graphic art and design, jewelry, and glass. It was international in scope, with celebrated exponents in England (Aubrey Beardsley), Paris (Alphonse Mucha), the U.S. (Louis Comfort Tiffany), Scotland (Charles Rennie Mackintosh), Spain (Antonio Gaudi), and Belgium (Victor Horta). The style did not significantly survive the outbreak of World War I. See also Arts and Crafts Movement; Jugendstil.

Arta, Gulf of Inlet of the Ionian Sea, western Greece. It is 25 mi (40 km) long and 4-10 mi (6-16 km) wide. On its shores are the ruins of several cities important in ancient Greece. The seaport of Preveza, founded 290 bc, is to the north; the Battle of Actium took place near the gulf’s entrance.

Artaud \ar-'to\, Antonin (b. Sept. 4, 1896, Marseille, France — d. March 4, 1948, Ivry-sur-Seine)

French poet, actor, and drama theorist. He wrote Surrealist poetry from 1925 and made his acting debut in Surrealist productions in Paris. He described his theory of drama in the Manifesto of the Theatre of Cruelty (1932; see Theatre of Cruelty) and The Theatre and Its Double (1938).

His own plays (including Les Cenci,

1935) were failures, but his theories exerted great influence on playwrights of the Theatre of the Absurd.

Lifelong mental illness confined him periodically to asylums from 1936.

Artemis Var-to-mosV In Greek religion, the goddess of wild animals, the hunt, vegetation, chastity, and childbirth. Artemis was the daughter of Zeus and Leto and the twin sister of

Apollo. Accompanied by nymphs, she danced in mountains and forests. She both killed game and, as Mistress of Animals (see Master of the Animals), protected it. Stories of her nymphs' love affairs may originally have been told of the goddess herself, but poets after Homer stressed her chastity. She was known for her unpitying wrath when offended. Artemis may have developed out of Ishtar in the East.

Her Roman counterpart was Diana.

artemisia \ l ar-t3-'mi-zh3\ Any of a genus (Artemisia) of aromatic herbs and shrubs in the composite family. Examples include wormwood, SAGEBRUSH, and TARRAGON.

Many species are valued as ornamentals for their attractive silvery gray foliage, which is frequently used in horticultural plantings to create contrast or to smooth the transition between intense colors. The leaves of common wormwood (A. absinthium) have been used in medicines and beverages such as absinthe and vermouth. An extract from the Eurasian A. annua is used to treat quinine-resistant malaria.

Artemisia \,art-9-'miz-e-3\ I (fl. 5th century bc) Queen of Halicarnas-

sus and of the island of Cos c. 480 bc. She ruled under the Persian king Xerxes and helped him invade Greece (480^179). She commanded five ships in the Battle of Salamis; according to Herodotus, she advised Xerxes to retreat from Greece rather than risk another engagement.

Artemisia II (d. c. 350 bc) Sister and wife of King Mausolus (r. 377-353 bc) of Caria, southwestern Anatolia, and sole ruler for about three years after his death. She built his tomb, the Mausoleum, considered one of the Seven Wonders of the World.

arteriography See angiography

arteritis N.ar-ts-'rl-tosV Inflammation of the arteries. It occurs in diseases including syphilis, tuberculosis, and lupus erythematosus. Varieties not closely associated with systemic disease or disease of an organ outside the cardiovascular system have been described as temporal arteritis, polymyalgia rheumatica, and polyarteritis nodosa.

artery Vessel that carries blood from the heart to other parts of the body (see cardiovascular system).

Arterial blood carries oxygen and nourishment to tissues; the one exception is the pulmonary artery, which conveys oxygen-depleted blood from the heart to the lungs for oxygenation and removal of excess carbon dioxide. Arteries are muscular, elastic tubes that transport blood under the pressure of the heart’s pumping action, which can be felt as the pulse. Large arteries branch off from the aorta and give rise to smaller arteries, down to the threadlike arterioles, which branch into capillaries. An artery wall’s inner layer (tunica intima) consists of an endothelial (cellular) lining, a fine connective tissue network, and a layer of elastic fibres. The middle layer (tunica media) is mostly smooth muscle cells. The outer layer (tunica externa) contains supportive collagen fibres. See also capillary; vein.

"The Whiplash," Art Nouveau tapestry by Hermann Obrist, silk embroidered on wool, 1 895; in the Munchner Stadtmuseum, Munich.

COURTESY OF THE MUNCHNER STADTMUSEUM, MUNICH

Artemis as a huntress, classical sculpture; in the Louvre.

AUNARI/ART RESOURCE

Artemisia II, statue by an unknown artist; in the National Archeological Museum, Naples.

ANDERSON— AUNARI FROM ART RESOURCE

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centipede
class Chilopoda

subphylum Uniramia

subphylum Chelicerata

class Copepoda

barnacle
class Cirripeda

subphylum Crustacea

subphylum Trilobita

Representative arthropods. Uniramia, the largest of the arthropod subphyla, contains mo

insects, the largest arthropod class, differ from other arthropods in that they are usu
mostly marine-dwelling and include the shrimps, lobsters, crabs, and barnacles. The mic
members of this subphylum, are part of the zooplankton. Most members of the Chelicerata
trilobites (members of the Trilobita subphylum) are extinct marine arthropods that flou
gitudinal lobes divided into three regions— head, thorax, and tail.

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arthritis \ar-'thri-t9s\ Inflammation of the joints and its effects. Acute arthritis is marked by pain, redness, and swelling. The principal forms are osteoarthritis, rheumatoid arthritis, and septic arthritis. Several forms of arthritis are part of the symptom complexes of autoimmune diseases.

arthropod Any member of the largest phylum, Arthropoda, in the animal kingdom. Arthropoda consists of more than one million known invertebrate species in four subphyla: Uniramia (five classes, including insects), Chelicerata (three classes, including arachnids and horseshoe crabs), Crustacea (crustaceans), and Trilobita (trilobites). All arthropods are bilaterally symmetrical and possess a segmented body covered by an exoskeleton containing chitin, which serves as both armour and a surface for muscle attachment. Each body segment may bear a pair of jointed appendages. The phylum includes carnivores, herbivores, omnivores, detritus feeders, filter feeders, and parasites (see parasitism) in nearly all environments, both aquatic and terrestrial. See illustration above.

Arthur, Chester A(lan) (b. Oct. 5, 1829, North Fairfield, Vt., U.S. — d. Nov. 18, 1886, New York, N.Y) 21st president of the U.S. (1881-85). He practiced law in New York City from 1854, later becoming a close associate of Sen. Roscoe Conkling, the Republican boss of New York. With Conkling’s backing, he was appointed customs collector for the port of New York (1871-78), an office long known for its use of the spoils system. He conducted the business of the office with integrity but continued to pad its payroll with Conkling loyalists. At the Republican national convention in 1880, Arthur was the compromise choice for vice president on

a ticket with James Garfield; he became president on Garfield’s assassination. As president, Arthur displayed unexpected independence by vetoing measures that rewarded political patronage. He also signed the Pendleton Civil Service Act, which created a civil-service system based on merit. He and his navy secretary recommended appropriations that later helped transform the U.S. Navy into one of the world’s great fleets. He failed to win his party’s nomination for a second term.

Arthurian legend Body of stories and medieval romances centring on the legendary English king Arthur. The stories chronicle Arthur’s life, the adventures of his knights, and the adulterous love between his knight Sir Lancelot and his queen, Guinevere. The legend was popular in Wales before the 11th century, was brought into literature by Geoffrey of Monmouth, and was adapted by other medieval writers, including Chretien de Troyes, Wace, Layamon, and Sir Thomas Malory, becoming entwined with legends of the Holy Grail. From Victorian times, when interest in the legend revived, it has figured in major works by Alfred Tennyson (Idylls of the King) and T.H. White (The Once and Future King). It is uncertain whether Arthur was a historical figure. Medieval sources say he was a 6th-century warrior and champion of Christianity who united the British tribes against the Saxon invaders, died in battle at Camlann c. 539, and

was buried at Glastonbury. See also Galahad; Merlin; Tristan and Isolde.

Arthur's Pass or Arthur Pass Mountain pass. Southern Alps, New Zealand. It lies at an elevation of 3,020 ft (920 m) at the northern end of the mountain range and provides the main railway and highway passage.

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with the rail line passing through the Otira Tunnel (5.3 mi [8.6 km]). Arthur’s Pass National Park was created in 1929.

Artibonite River \,ar-te-b6-'net\ River, Hispaniola Island. Rising in the Cordillera Central of the Dominican Republic, it flows along the Haitian border and then west and northwest into and through Haiti’s Artibonite Plain to enter the Gulf of Gonaives after a course of some 150 mi (240 km). It is the island’s longest river.

artichoke Large, coarse, herbaceous, thistlelike perennial plant {Cynara scolymus) of the composite family. The thick edible scales and bottom part (heart) of the immature flower heads are a culinary delicacy. The artichoke is native to the Mediterranean and is cultivated extensively in other regions with rich soil and a mild, humid climate. The Jerusalem artichoke is a tuber and does not resemble the artichoke.

Articles of Confederation Early U.S. constitution (1781-89) under the government by the Continental Congress, replaced in 1787 by the U.S. Constitution. It provided for a confederation of sovereign states and gave the Congress power to regulate foreign affairs, war, and the postal service, to control Indian affairs, and to borrow money. Under the Articles, Congress settled state claims to western lands and established the Northwest Ordinances. But Congress had no power to enforce its requests to the states for money or troops, and by late 1786 the government had ceased to be effective, as was demonstrated by Shays's Rebellion (1786-87) against courts that had been enforcing seizures of property for debt. Delegates to the Annapolis Convention called a meeting of all the states to amend the Articles.

articulation In phonetics, the shaping of the vocal tract (larynx, pharynx, and oral and nasal cavities) by positioning mobile organs (such as the tongue) relative to other parts that may be rigid (such as the hard palate) and thus modifying the airstream to produce speech sounds. Articulators include the tongue, lips, teeth and upper gum ridge, hard and soft palate, uvula, pharyngeal wall, and glottis. Primary articulation refers either to where or how the vocal tract is narrowed or blocked to produce a consonant, or to the tongue contour, lip shape, and larynx height that determine the sound of a vowel. Other articulators may be used to produce a secondary articulation such as palatalization (the front of the tongue approaching the hard palate), glottalization (complete or partial closure of the vocal cords), or nasalization (simultaneous passage of air through the

nasal and oral tracts).

artificial heart Machine or mechanical pump that maintains blood circulation in the human body. The heart-lung machine, a mechanical pump, can maintain circulation for a few hours while the heart is stopped for surgery. It shunts blood away from the heart, oxygenates it, and returns it to the body. No device has yet been developed for total, long-term replacement of the heart; existing artificial hearts reduce the heart's workload by pumping between beats or acting as an auxiliary ventricle and are suitable only as temporary replacements in patients awaiting transplant. See also PACEMAKER.

artificial insemination Introduction of semen into a female's vagina or cervix by means other than sexual intercourse. First developed for animal breeding in the early 20th century in Russia, it is now also used to induce pregnancy in women whose partners cannot impregnate them. The partner's (or other donor's) semen is inserted with a syringe. Though reasonably successful, artificial insemination in humans raises moral issues that are not yet fully resolved. In livestock, deep-frozen semen from a male animal can be stored for long periods without losing its fertility, thus allowing a single bull to sire as many as 10,000 calves a year.

artificial intelligence (Al) Ability of a machine to perform tasks thought to require human intelligence. Typical applications include game playing, language translation, expert systems, and robotics. Although pseudo-intelligent machinery dates back to antiquity, the first glimmerings of true intelligence awaited the development of digital computers in the 1940s. AI, or at least the semblance of intelligence, has developed in parallel with computer processing power, which appears to be the main limiting factor. Early AI projects, such as playing chess and solving mathematical problems, are now seen as trivial compared to visual pattern recognition, complex decision making, and the use of natural language. See also Turing test.

artificial respiration Breathing induced by any of several techniques in a person who has stopped or is having difficulty breathing. It consists chiefly of keeping the air passage open and inducing inhalation and exhalation. It does not include chest compressions to maintain circulation (see cardiopulmonary resuscitation). The primary method is mouth-to-mouth breathing, in which the rescuer breathes into the victim's mouth, with pauses to allow exhalation.

Artigas \ar-'te-gas\, Jose Gervasio (b. June 19, 1764, probably Montevideo [Uru.] — d. Sept. 23, 1850, Ibiray, near Asuncion, Para.) Soldier and revolutionary leader regarded as the father of Uruguayan independence. In his youth Artigas was a gaucho in what is now Uruguay. Allied with the Buenos Aires junta, he fought for independence from Spain and won a brilliant victory at Las Piedras. His insistence on federalism against the efforts of Buenos Aires to assert control over the entire region led to civil war. He ruled over a portion of what is now Uruguay and central Argentina until a Portuguese invasion forced him into exile in 1820. Uruguay achieved independence in 1828.

artillery In modern military science, big guns such as cannons, howitzers, or mortars operated by crews and of a calibre greater than 15 mm. The earliest artillery, introduced in the 14th century, were cannons and

mortars of bronze, brass, or iron mounted on two- wheeled carriages. Modern artillery dates from the second half of the 19th century, when advances included steel gun barrels, more powerful gunpowders, and piston mountings that held artillery carriages steady during recoil. Both powder and projectile were encased in a shell, which allowed for faster loading. Since World War II, artillery has been ranked as light (up to 105 mm, for support of ground troops), medium (106-155 mm, for bombardment), and heavy (over 155 mm, for attacking rear installations). See also antiaircraft gun.

Arts and Crafts movement English social and aesthetic movement of the second half of the 19th century, dedicated to reestablishing the importance of craftsmanship in an era of mechanization and mass production. The name derives from the Arts and Crafts Exhibition Society (1888). Inspired by John Ruskin and other writers who deplored the effects of industrialization, William Morris founded a firm of interior designers and manufacturers to produce handcrafted textiles, printed books, wallpaper, furniture, jewelry, and metalwork. The movement was criticized as elitist and impractical in an industrial society, but in the 1 890s its appeal widened and spread to other countries, including the U.S. See also Art Nouveau.

An English room decorated by William Morris in the Arts and Crafts style.

COURTESY OF THE VICTORIA AND ALBERT MUSEUM, LONDON, PHOTOGRAPH, JOHN WEBB

Aru \'a-,ru\ Islands Island group, eastern Indonesia. The easternmost island group of the Moluccas, located off southwestern New Guinea, it stretches north-south about 1 10 mi (180 km) and extends some 50 mi (80 km) east-west. The group consists of six main islands (Warilau, Kola, Wokam, Kobroor, Maikoor, and Trangan), which are separated by narrow channels, and dozens of smaller islands. Dobo, on Wamar Island, is the principal harbour. The islands became part of Indonesia in 1949.

Aruba Island (pop., 2005 est.: 97,400), Lesser Antilles, off northwestern Venezuela. Aruba is an internally self-governing part of The Netherlands. It has an area of 75 sq mi (193 sq km). Its capital is Oranjestad.

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The majority of the present-day population is a combination of mostly American Indian, Spanish, and Dutch ancestry. Dutch is the official language; Papiamento, a Creole language, is used for daily affairs. The principal religion is Roman Catholicism. The currency is the Aruban florin. Aruba’s lack of water severely limits agriculture. The large petroleum-refining complex there, once the island’s main employer, reopened after closing in the mid-1980s, but tourism has become the island’s economic

mainstay. The earliest inhabitants were Arawak Indians, whose cave drawings can still be seen. Though the Dutch took possession of Aruba in 1636, they did not begin to develop it aggressively until 1816. The Netherlands controls Aruba’s defense and foreign affairs, but internal affairs are handled by an island government directing its own judiciary and currency. In 1986 Aruba seceded from the Federation of the Netherlands Antilles in an initial step toward independence.

arugula \9-'ru-g3-b\ or rocket Yellowish-flowered European herbaceous plant (Eruca vesicaria sativa), of the mustard family, cultivated for its foliage, which is used especially in salads. The leaves taste sharp and peppery when young and succulent but become bitter with age. A medicinal oil is extracted from the seeds.

arum \'ar-3m\ family Family Araceae, containing about 2,000 species, many of which are popular ornamentals and foliage plants. Native primarily to the tropics and subtropics, a few species grow in temperate zones. The genera Philodendron and Monstera are grown for their vine-like habit and large green leaves. Other arums grown ornamentally include the florist’s calla lily and the water arum (Calla palustris). Jack-in-the-pulpit (Arisaema triphyllum) is well known in woodlands, and the foul-smelling eastern skunk cabbage (Symplocarpus foetidus) in marshes. The genus Arum contains about 15 perennial species noted for funnel-shaped bracts and glossy, arrow-shaped leaves. Sap in Arum species can be poisonous.

Arunachal Pradesh Var-u-.na-chol-pro-'deshX State (pop., 2001: 1,097,968), extreme northeastern India. Bordered by Bhutan, Tibet (China), and Myanmar and Nagaland and Assam states, it occupies 32,333 sq mi (83,743 sq km); its capital is Itanagar. A portion of the region was annexed by the Ahom rulers of Assam in the 16th century. By 1826 the British had made Assam part of British India. Later called the North East Frontier Agency, the region became Arunachal Pradesh union territory in 1972 and was granted statehood in 1987. It incorporates major ranges of the Himalaya foothills and has a rugged terrain. The population consists of many ethnic groups who speak dialects of the Tibeto-Burman linguistic family.

arupa-loka Va-.rii-po-'lo-koV In Buddhism, the “world of immaterial form,” the highest of the three spheres of existence in which rebirth takes place. The others are the “fine-material world” (rupa-loka) and the “world of feeling” (kama-loka). In the arupa-loka, existence depends on the stage of concentration attained in the previous life, of which there are four levels: the infinity of space, the infinity of thought, the infinity of nonbeing, and the infinity of neither consciousness nor nonconsciousness. Beings in the arupa-loka do not have a material body.

Arusha National Park Preserve, northern Tanzania. Established in 1960, the park contains a rich variety of flora and fauna. It is the site of Mount Meru (14,978 ft [4,565 m]) and Ngurdoto Crater, an extinct volcano. Nearby are Mount Kilimanjaro, Olduvai Gorge, and Ngorongoro Crater, whose surrounding area teems with wildlife.

Arya Samaj Var-yo-sa-'majX Reform sect of Hinduism, founded in 1875 by Dayananda Sarasvati, in order to reestablish the Vedas as revealed and infallible truth. The Arya Samaj opposes idolatry, ancestor worship, animal sacrifice, a caste system based on birth rather than merit, untouchability (see untouchable), child marriage, pilgrimages, and temple offerings. It upholds the sanctity of the cow, samskaras, oblations to fire, and social

reform, including the education of women. Strongest in western and northern India, it is governed by representatives elected to samajas (“societies”) at the local, provincial, and national levels, and it played an important role in the growth of Indian nationalism.

Aryabhata I (b. 476, possibly Ashmaka or Kusumapura, India) Astronomer and the earliest Indian mathematician whose work survives. He composed at least two works, Aryabhatiya (c. 499) and the now lost Aryabhatasiddhanta, which circulated mainly in the northwest of India and influenced the development of Islamic astronomy. Written in verse couplets, Aryabhatiya deals with mathematics and astronomy. Topics include prediction of solar and lunar eclipses and an explicit statement that the apparent westward motion of the stars is due to the spherical Earth’s rotation about its axis. Aryabhata also correctly ascribed the luminosity of the Moon and planets to reflected sunlight. The Indian government named its first satellite Aryabhata (launched 1975) in his honour.

Aryan Var-e-on\ Prehistoric people who settled in Iran and northern India. From their language, also called Aryan, the Indo-European languages of South Asia are descended. In the 19th century there arose a notion, propagated by the count de Gobineau and later by his disciple Houston Stewart Chamberlain, of an “Aryan race”: people who spoke Indo-European, especially Germanic, languages and lived in northern Europe. The “Aryan race” was considered to be superior to all other peoples. Although this notion was repudiated by numerous scholars, including Franz Boas, the notion was seized on by Adolf Hitler and made the basis of the Nazi policy of exterminating Jews, Gypsies (Roma), and other “non-Aryans.” See also racism.

Asad, Hafiz al- See Hafiz al-AssAD

ASALA acronym for Armenian Secret Army to Liberate Armenia Marxist-Leninist group formed in 1975 to force the Turkish government to acknowledge the Armenian massacres of 1915 and pay reparations. Its activities, which have included acts of terrorism, have been directed against Turkish government officials and institutions. Its founder, Hagop Hagopian, was killed in 1988; thereafter the group’s activities diminished.

Asam \'az-am\, Cosmos Damian and Egid Quirin (respectively b. Sept. 29, 1686, Benediktbeuren, Bavaria — d. May 10, 1739, Munich; b. Sept. 1, 1692, Tegemsee, Bavaria — d. April 29, 1750, Mannheim, Palatinate) Bavarian architects and decorators. After studying in Rome (1711-13), Cosmas Damian became a prolific fresco painter, and his brother, Egid Quirin, became a sculptor and stuccoist. They developed the effects of dramatic lighting and illusionism originated by Gian Lorenzo Bernini and Andrea Pozzo. Working as a team, they produced magnificent illusionistic decoration in ecclesiastical buildings, combining dramatic lighting and colour. Their works are notable for their profound and dramatic intensity of religious feeling. The brothers became the principal late Baroque exponents of illusionist decoration in religious architecture. Their most notable collaboration is the church of St. John Nepomuk in Munich (1733-46) — known as the Asamkirche in honour of the brothers.

Asante or Ashanti People of southern Ghana and adjacent areas of Togo and Cote d’Ivoire. The largest segment of the Akan peoples, they speak Twi, a language of the Kwa group of Niger-Congo languages; all

together the Akan peoples make up about half the population of Ghana. Though some Asante now live and work in urban centres, most live in villages and engage in agriculture. The symbol of Asante unity is the Golden Stool, held to be so sacred that not even kings were allowed to sit on it. The Asante supplied slaves to British and Dutch traders in exchange for firearms, which they used to build up a large empire in the 18th and 19th centuries. They fought several wars against the British (1824, 1863, 1869, 1874), finally losing their capital, Kumasi, in 1896. Thereafter what remained of the empire went into decline. Asante gold-work and kente cloth remain prominent items of trade. See also Fante.

asbestos Any of several minerals that separate readily into long, flexible fibres. Chrysotile accounts for about 95% of all asbestos still in commercial use. The other types all belong to the amphibole group and include the highly fibrous forms of anthophyllite, amosite, crocidolite, tremolite, and actinoute. Asbestos fibre was used in brake linings, insulation, roofing shingles, floor and ceiling tiles, cement pipes, and other building materials. Asbestos fabrics were used for safety apparel and theatre curtains. In the 1970s it was found that prolonged inhalation of the tiny asbestos fibres can cause asbestosis, lung cancer, and/or mesothelioma, all serious lung diseases. The incidence of mesothelioma is most commonly associated with extensive inhalation of amphibole asbestos. In 1989 the U.S. government instituted a gradual ban on the manufacture, use, and export of most products made with asbestos.

asbestos, amphibole See amphibole asbestos

asbestosis X.as-.bes-'to-sosV Lung disease caused by long-term inhalation of asbestos fibres. A pneumoconiosis found primarily in asbestos workers, asbestosis is also seen in people living near asbestos industries. Fibres remain in the lungs and many years later cause extensive scarring and fibrosis. Shortness of breath and inadequate oxygenation result; advanced cases include a dry cough. There is no effective treatment. The associated increased cardiac effort may induce heart disease. Cigarette smoking

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greatly exacerbates its symptoms. Lung cancer and malignant mesothelioma are more common with asbestos inhalation and asbestosis.

Ascalon See Ashqelon

Ascanius \as-'ka-ne-os\ In Roman legend, the son of Aeneas and founder of Alba Longa (probably the site of modern Castel Gandolfo) near Rome. In Livy’s account, his mother was Lavinia, and he was born after Aeneas founded Lavinium. Ascanius was also called Iulus, and he was considered the founder of the line that included Julius Caesar.

Ascension In Christian belief, the ascent of Jesus into heaven 40 days after the Resurrection. The Book of Acts relates that, after several appear-

ances to the Apostles over a period of 40 days, Jesus was taken up in their presence and hidden behind a cloud, a symbol of God’s presence. The event is thought to indicate a new relationship between Jesus and God and between Jesus and his followers. The feast of the Ascension is universally observed by Christians, and its celebration emphasizes the kingship of Christ. Since the 4th century, it has been celebrated 40 days after Easter and 10 days before Pentecost.

asceticism Vo-'set-o-.siz-omX Practice of the denial of physical or psychological desires in order to attain a spiritual ideal or goal. Most religions have some features of asceticism. The desire for ritual purity in order to come in contact with the divine, the need for atonement, and the wish to earn merit or gain access to supernatural powers all are reasons for ascetic practice. Christian hermits and monks, wandering Hindu ascetics, and Buddhist monks all reject worldly goods and practice various forms of self-denial, including celibacy, abstinence, and fasting. Members of the Digambara sect of Jainism practice an extreme form of asceticism that includes the rejection of wearing clothes. Though monasticism is rejected in the Qur’an, ascetic movements such as zuhd have arisen in Islam. Zoroastrianism forbids fasting and mortification.

Asch \'ash\, Sholem (b. Nov. 1, 1880, Kutno, Pol., Russian Empire — d. July 10, 1957, London, Eng.) Polish-born U.S. novelist and playwright. Much of his writing concerns the experience of Jews in eastern European villages or as immigrants in the U.S. (to which he himself immigrated in 1914). It includes the play The God of Vengeance (1907) and the novels Mottke the Thief (1916), Uncle Moses (1918), Judge Not (1926), and Chaim Lederer’s Return (1927). In later, more controversial works, he explored the common heritage of Judaism and Christianity. His career was outstanding for both output and impact, and he is one of the best-known writers in modern Yiddish literature.

Ascham Vas-konA, Roger (b. 1515, Kirby Wiske, near York, Eng. — d. Dec. 30, 1568, London) English humanist, scholar, and writer. He entered Cambridge University at age 14 and studied Greek. He became the future Queen Elizabeth I’s tutor in Greek and Latin (1548-50) and continued to serve her after she took the throne. His best-known book is the posthumous The Scholemaster (1570), which deals with the psychology of learning, the education of the whole person, and the ideal moral and intellectual personality that education should mold. He is notable also for his lucid prose style and his promotion of the vernacular.

ASCII Vas-,ke\ in full American Standard Code for Information Interchange. Data-transmission code used to represent both text (letters, numbers, punctuation marks) and noninput device commands (control characters) for electronic exchange and storage. Standard ASCII uses a string of 7 bits (binary digits) for each symbol and can thus represent 2 7 = 128 characters. Extended ASCII uses an 8-bit encoding system and can thus represent 2 8 = 256 characters. While ASCII is still found in legacy data, Unicode, with 8-, 16-, and 32-bit versions, has become standard for modem operating systems and browsers. In particular, the 32-bit version now supports all of the characters in every major language.

Asclepius \as-'kle-pe-9s\ Latin Aesculapius \,es-ky9-'la-pe-9s\ Greco-Roman god of medicine. He was the son of Apollo and the nymph Coronis. He learned the art of healing from the Centaur Chiron. Fearful that Asclepius would make humans immortal, Zeus slew him with a thunderbolt. His cult originated in Thessaly and spread throughout Greece.

Because he was said to cure the sick in dreams, the practice of sleeping in his temples became common. Asclepius was often represented holding a staff with a serpent coiled around it. See photograph opposite.

ascorbic acid See vitamin C

ASEAN in full Association of Southeast Asian Nations International organization established by the governments of Indonesia, Malaysia, the Philippines, Singapore, and Thailand in 1967 to accelerate regional economic growth, social progress, and cultural development and to promote peace and security in the region. Brunei became a member in 1984, Vietnam in 1995, Laos and Myanmar (Burma) in 1997, and Cambodia in 1999. ASEAN became a leading voice on regional trade and security issues in the 1990s; in 1992 member nations created the ASEAN Free Trade Area.

Asgard \'as-,gard\ In Norse mythology, the dwelling place of the gods. It consisted of 12 or more realms, including Valhalla, home of Odin; Thrudheim, home of Thor; and Breidablick, home of Balder. Each Norse god had his own palace in Asgard. This heavenly region could only be reached from earth via the rainbow bridge called Bifrost.

ash Any tree of the genus Fraxinus, in the olive family. The genus includes about 70 species of trees and shrubs found mostly in the Northern Hemisphere. The U.S. boasts 18 species of ash, 5 of which furnish most of the ash cut as lumber. Most important are the white ash (F. americana) and the green ash (F. pennsylvanica), which yield wood that is stiff, strong, and resilient, yet lightweight. This “white ash” is used for baseball bats, hockey sticks, paddles and oars, tennis and other racket frames, and the handles of agricultural tools. Black ash (F. nigra), blue ash (F. quadrangulata), and Oregon ash (F. latifolia) produce wood of comparable quality that is used for many more purposes, including furniture, interior paneling, and barrels.

Ash Can school Group of U.S. realist painters, active in New York City c. 1908-18, who specialized in scenes of everyday urban life. Inspired by Robert Henri, the core group included William Glackens, George Luks (1867-1933), Everett Shinn (1876-1953), and John Sloan. As artist-reporters on the Philadelphia Press before moving to New York, they had developed a quick eye and a memory for detail. Though they often depicted slums and outcasts of the city, they were more interested in the picturesque aspects of these subjects than in the social issues they raised. George Wesley Bellows and Edward Hopper were also associated with the group. See also The Eight.

ash cone See cinder cone

Ash Wednesday See Lent

Ashanti See Asante

Ash'ari \'a-sha-re\, Abu al-Hasan al- (b. 873/874, Basra, Iraq — d. 935/936, Baghdad) Muslim Arab theologian. He probably belonged to the family of Abu Musa al-Ash c ari, one of the Companions of

the Prophet. He joined the Mu'tazilah school and compiled scholarly opinions in his Maqdlat al-Islamlyin (“Theological Opinions of the Muslims”). At about age 40 he concluded that his method had led to sterile concepts of God and humanity, and he turned to more orthodox theology. He expanded his Maqalat and authored Kitdb al-Luma ‘ (“The Luminous Book”). Reflecting on the ideas of al-MuHASiBi and others, he created his own school, which became known as the Khorasan, or Ash'arite, school. See also Ash'ariyyah.

Ash'ariyyah School of Muslim theology founded by Abu al-Hasan al- Ash'ari in the 10th century. It supported the use of reason and speculative theology (kalam) to defend the faith but was not as extreme in its rationalism as the Mu'tazilah school. Followers attempted to demonstrate the existence and nature of God through rational argument, while affirming the eternal, uncreated nature of the Qur’an. They were

Asclepius, from an ivory diptych, 5th century ad; in the Liverpool City Museum, England

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accused by the Mu'tazilah of believing in predestination because they claimed the human capacity for action was only acquired at the very moment of action.

Ashbery, John (Lawrence) (b. July 28, 1927, Rochester, N.Y., U.S.) U.S. poet. He earned degrees from Harvard and Columbia universities and subsequently became known as an art critic. His poems, noted for their elegance, originality, and obscurity, are characterized by arresting images, exquisite rhythms, intricate form, and sudden shifts in tone and subject. His collections include The Double Dream of Spring (1970), Self-Portrait in a Convex Mirror (1975, Pulitzer Prize, National Book

Award), A Wave (1984), Flow Chart (1991), and Wakefulness (1998).

Ashcroft, Dame Peggy orig. Edith Margaret Emily Ashcroft

(b. Dec. 22, 1907, Croydon, London, Eng. — d. June 14, 1991, London) British actress. She made her debut in 1927 and appeared from 1932 with the Old Vic company, winning acclaim in Romeo and Juliet (1935). She starred in more than 100 stage productions, playing comedy and tragedy with equal success. One of the great actresses of the British stage, she was a founding member of the Royal Shakespeare Co. (1961) and later a director. She acted in films such as The Thirty-nine Steps (1935) and A Passage to India (1984, Academy Award) and in the television series The Jewel in the Crown (1984).

Ashe, Arthur (Robert), Jr. (b. July 10, 1943, Richmond, Va., U.S.— -d. Feb. 6, 1993, New York, N.Y.) U.S. tennis player. He won his first grand-slam singles title (the 1968 U.S. Open) as an amateur. The first African American member of the U.S. Davis Cup team, he helped win five championships (1963, 1968, 1969, 1970, 1978). In 1975 he won the Wimbledon singles title and received World Championship Tennis top ranking. He retired in 1980 and became captain of the U.S. Davis Cup team (to 1985). Off the court he was a critic of racial injustice, including South Africa's apartheid policy. In 1992 he revealed that he had been infected with HIV by a transfusion following surgery, and he thereafter devoted time to increasing public awareness of AIDS. The U.S. Open is now played at Arthur Ashe Stadium, which opened at the National Tennis Center in Flushing, N.Y., in 1997.

Ashford, Evelyn (b. April 15, 1957, Shreveport, La., U.S.) U.S. sprinter. She attended UCLA, where she won four national collegiate championships and competed in the 1976 Olympics in Montreal. She went on to win world championships (100- and 200-m sprints) in 1979 and 1981 and was named Woman Athlete of the Year both years. She won two gold medals in the 1984 Olympics (100-m dash, 4 x 100-m relay) and a silver and a gold medal in the 1988 Olympics (in the same events). At the 1992 games, her fifth Olympics, she became the oldest woman (at 35) to win a gold medal in track and field (4 x 100-m relay).

Ashgabat Vash-ga-,bat\ formerly Ashkhabad Vash-ko-.badX City (pop., 1999 est.: 605,000), capital of Turkmenistan. It lies in an oasis at the northern foot of the Kopet-Dag Range near the Iranian border. Founded in 1881 as a Russian military fort, it was the capital of Turkmenistan S.S.R. (1924-90). A violent earthquake destroyed the city in 1948; it was rebuilt on the same plan. It is now an industrial, transportation, and cultural centre.

Ashikaga \,a-she-'ka-ga\ family Japanese warrior family that established the Ashikaga shogunate in 1338. The founder, Ashikaga Takauji (1305-58), supported the emperor Go-Daigo's attempt to wrest control of the country from the Hojo family, but then turned on him and set up an emperor from another branch of the imperial family, who granted Takauji the title of shogun. Takauji' s grandson Yoshimitsu (1358-1408), the third Ashikaga shogun, ended the dual imperial courts that had resulted from his grandfather's actions, took an active role in the court bureaucracy, and reorganized civil government. Yoshimitsu reopened formal trade with China and is remembered as a sponsor of the arts; he commissioned the famous Golden Pavilion (Kinkaku-ji) in Kyoto. Ashikaga Yoshimasa (1436-90), the eighth Ashikaga shogun, was also a great patron of the

arts and a devotee of the tea ceremony. He commissioned the Silver Pavilion (Ginkaku-ji), whose understated elegance contrasts with the opulence of the Golden Pavilion. Politically, Yoshimasa' s tenure as shogun coincided with increasing loss of control over the countryside as Japan headed toward a century of civil war. See also Muromachi period; daimyo; Onin War; samurai.

Ashkenazi \,ash-k3-'na-ze\ Any of the historically Yiddish-speaking European Jews who settled in central and northern Europe, or their

descendants. They lived originally in the Rhineland valley, and their name is derived from the Hebrew word Ashkenaz ("Germany"). After the start of the Crusades in the late 11th century, many migrated east to Poland, Lithuania, and Russia to escape persecution. In later centuries Jews who adopted the German-rite synagogue ritual were called Ashkenazim to differentiate them from the Sephardic, or Spanish-rite, Jews (see Sephardi), from whom they differ in cultural traditions, pronunciation of Hebrew, and synagogue chanting as well as in the use of the Yiddish language (until the 20th century). Today they constitute more than 80% of the world's Jews.

Ashley, William Henry (b. c. 1778, Powhatan, Va., U.S. — d. March 26, 1838, Cooper county, Mo.) U.S. fur trader. Arriving in Missouri about 1802, he prospered in mining and land speculation. In 1820 he became the state's first lieutenant governor. With Andrew Henry (1771-1833), he organized the Rocky Mountain Fur Co. in 1 822 and established a trading post at the mouth of the Yellowstone River. Forced to abandon the post by Indians, he instituted the annual rendezvous (1825), where trappers would trade their furs to him for supplies for the next year. By 1827 he had made a fortune and retired. Elected to the U.S. House of Representatives (1831-37), he championed Western interests.

Ashoka \3-'sho-k3\ or Asoka \3-'so-ko\ (b. c. 304 — d. c. 232 bc) Last major emperor (c. 269-232 bc) of the Mauryan empire in India and a patron of Buddhism. After his bloody conquest of Kalinga in the eighth year of his reign, Ashoka renounced military aggression and resolved to live according to the dharma. He spoke of Buddhism only to fellow Buddhists and adopted a policy of toleration for other religions. He spread Buddhist teachings through inscriptions known as the Rock Edicts and Pillar Edicts. He enjoined officials to be aware of the needs of common people and to dispense justice impartially; dharma ministers were appointed to relieve suffering and look to the special needs of other religions, women, outlying regions, and neighbouring peoples. He erected stupas and monasteries, developed a course of study for adherents, and sent missionaries to Sri Lanka. He is remembered as the ideal Buddhist ruler.

Ashqelon \'ash-k9-,lan\ formerly Ascalon Town (pop., 2000 est.: 98,937) and archaeological site, Israel. The historic coastal city-state of Ascalon was traditionally the key to the conquest of southwestern Palestine. Its name appears in Egyptian texts as early as c. 1800 bc. It was conquered by several ancient empires, including that of Alexander the Great (332 bc). Conquered by the Arabs in ad 636, it was taken by Crusaders in 1153 and became one of their principal ports (see Crusades). It was retaken by the Ayyubid sultan Saladin in 1 1 87 and destroyed by the Mamluk sultan Baybars I in 1270. Modern Ashqelon, originally an Arab town, was resettled by Israelis after 1949 and is now a resort and industrial centre.

ashram Yash-rem, 'ash-,ram\ or ashrama Vash-ro-moX In Hinduism, any of the four stages of life through which a “twice-born” (see upanayana) Hindu ideally will pass. These stages are: the student, who is devoted and obedient to his teacher; the householder, who supports his family and the priests and fulfills duties to the gods and ancestors; the hermit, who withdraws from society to pursue ascetic and yogic practices; and the homeless mendicant, who renounces all possessions and wanders from place to place begging for food. In English the word has come to mean a place for the pursuit of spiritual or religious disciplines, often under a GURU.

Ash tart See Astarte

Ashton, Sir Frederick (William Mallandaine) (b. Sept. 17, 1904, Guayaquil, Ecua. — d. Aug. 18, 1988, Sussex, Eng.) Principal choreographer and director of England’s Royal Ballet. After creating ballets from 1925 for the Ballet Club (later Ballet Rambert), he joined the Vic-Wells Ballet (later Royal Ballet) in 1933, becoming principal choreographer, assistant director (1953-63), and director (1963-70). At least 30 of his works remain in its repertoire, including Fagade (1931), Symphonic Variations (1946), and Birthday Offering (1956). He also choreographed for companies such as the Royal Danish Ballet (Romeo and Juliet, 1955) and the New York City Ballet (Illuminations , 1950).

Ashur Ancient religious capital of Assyria. It is located on the Tigris River, 60 mi (97 km) south of Mosul, Iraq. The name Ashur was applied to the city, to Assyria itself, and to Assyria’s principal god. The capital’s site was originally occupied c. 2500 bc and later became part of Akkad. By the late 12th century bc it was under Assyrian control. Its religious sanc-

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Ashurbanipal carrying a basket in the rebuilding of the temple, stone bas-relief from the Esagila, Babylon, 650 bc; in the British Museum

tity ensured its continuous upkeep until 614 bc, when it was destroyed by Babylonia. The archaeological site has yielded fortifications, temples, and palaces.

Ashurbanipal \ 1 a-sor- , ba-ni- l pal\ (fl. 7th century bc) Last great Assyrian king (r. 668-627 bc). He was appointed crown prince of Assyria in 672 bc; his half-brother was appointed crown prince of Babylonia. On his father’s death, Ashurbanipal assumed full power without

incident. He quelled a rebellion in Egypt and successfully besieged Tyre. His half brother, who served him in Babylonia peacefully for 16 years, joined a coalition of peoples from outlying areas of the Assyrian empire and plotted rebellion, but Ashurbanipal discovered the plots and, after a three-year siege, took Babylon. By 639 bc he had the whole known world under his control. A person of religious zeal, he rebuilt or adorned most of the major shrines of Assyria and Babylonia. His principal intellectual accomplishment was the creation in Nineveh of the first systematically organized library in the Middle East; the clay tablets collected there preserved omen texts,

Mesopotamian epics, prayers and incantations, scientific texts, lexicographical texts, and folktales.

Asia Largest continent on Earth. It is bounded by the Arctic, Pacific, and

Indian oceans. The western boundary, with Europe, runs roughly north-south along the eastern Ural Mountains; the Caspian, Black, Aegean, and Mediterranean seas; the Suez Canal; and the Red Sea. The islands of Sri Lanka and Taiwan and the archipelagoes of Indonesia (excluding New Guinea), the Philippines, and Japan also form part of Asia. Area: 17,226,000 sq mi (44,614,000 sq km). Population (2004 est.): 3,879,659,000. Mountains and plateaus predominate on the continent, with the highest mountains located in Central Asia and north of the Indian subcontinent. Terrain features include Earth’s highest peak, Mount Everest, at 29,035 ft (8,850 m), and the lowest natural point, the Dead Sea, at 1,312 ft (400 m) below sea level. The largest of Asia’s many arid regions are the Thar and Gobi deserts. It has some of the longest rivers in the world, including the Euphrates, Tigris, Indus, Ganges (Ganga), Yangtze (Chang; the longest river in Asia), Huang He (Yellow), Ob, Yenisey, and Lena. The Caspian, Aral, and Dead seas are major saltwater lakes. About one-fifth of Asia’s landmass is arable. Its principal language groups include Sino-Tibetan, Indo-Aryan, Austronesian, Austroasiatic, and Semitic; important singular languages include Japanese and Korean. East Asia contains three main ethnic groups: Chinese, Japanese, and Korean. The Indian subcontinent is home to a vast diversity of peoples, most of whom speak languages from the Indo-Aryan subgroup of the Indo-European family. Because of the influence of China and the former Soviet Union, the Mandarin Chinese dialect and the Russian language are used widely. Asia is the birthplace of all the world’s major religions and hundreds of minor ones. Hinduism is the oldest major religion to have originated in southern Asia; Jainism and Buddhism emerged in the 6th and 5th centuries bc, respectively. Southwest Asia was the cradle of the so-called Abrahamic religions: Judaism, Christianity, and Islam. Daoism and Confucianism, both of which originated in the 6th or 5th century bc, have profoundly influenced Chinese culture and the cultures of surrounding peoples. Asia is marked by great disparities in wealth. A few countries, notably Japan, Singapore,

and the oil-rich countries of the Arabian Peninsula, have attained high standards of living; others, such as Bangladesh and Myanmar, are among the poorest. Between these two extremes lie Russia, China, and India. Asia is a land of great cultural diversity, but there are five main cultural influences: Chinese, Indian, Islamic, European, and Central Asian. China has had great influence in East Asia as the source of Confucianism, artistic styles, and the Chinese writing system. Indian influence has been expressed through Hinduism and Buddhism, affecting Tibet, Indonesia,

Cambodia, and Central Asia. Islam spread from its original Arabian home to become important in the Middle East, South Asia, Central Asia, and elsewhere. Members of the earlier human species Homo e rectus migrated from Africa to East Asia at least one million years ago. One of the earliest civilizations to use writing developed in the Tigris and Euphrates river valleys c. 3000 bc (see Mesopotamia). Civilization in the Indus River valley and in northern Syria followed c. mid-3rd millennium bc. Chinese urban civilization began with the Shang dynasty (c. 1600-1046 bc) and continued under the Zhou dynasty (1046-256 bc). Indo-European-speaking peoples (Aryans) began to invade India from the west c. 2000-1500 bc and developed the Vedic religion. A succession of empires and charismatic rulers, including the Macedonian Alexander the Great, spread their political control as far as military power could carry them. In the 13th century ad Genghis Khan and his Mongol successors united much of Asia under their rule. In the 14th century the Turkic warlord Timur conquered much of Central Asia. Muslim Turks destroyed the remnants of the Byzantine Empire in the 15th century. In the 19th century European imperialism began to replace Asian imperialism. Tsarist Russia pushed its political control across Asia to the Pacific Ocean, the British gained control of India and Burma (Myanmar), the French dominated eastern Southeast Asia (see French Indochina), the Dutch occupied the East Indies (Indonesia), and the Spanish and later the U.S. ruled the Philippines. After World War II (1939-45), European imperialism steadily disappeared as former colonies gained independence in the second half of the 20th century. See map on opposite page.

Asia Minor See Anatolia

Asimov Va-zi-.moA, Isaac (b. Jan. 2, 1920, Petrovichi, Russia — d. April 6, 1992, New York, N.Y., U.S.) Russian-born U.S. author and biochemist. He arrived in the U.S. at age 3, earned a doctorate from Columbia University, and subsequently taught for many years at Boston University. Before embarking on graduate study, he had already begun publishing his stories. “Nightfall” (1941) is often called the finest science-fiction short story ever written. His I, Robot (1950) greatly influenced how later writers treated intelligent machines. A trilogy of novels — Foundation, Foundation and Empire, and Second Foundation (1951—53) — is widely considered a classic. Asimov’s nonfiction science books for lay readers are noted for their lucidity and humour. Immensely prolific, he published more than 300 volumes in all.

Askja \'as-kya\ Caldera, Iceland. The largest crater in the Dyngjufjbl volcanic massif, Askja lies 20 mi (32 km) north of Vatnajokull, Iceland’s largest ice field. Its rugged peaks, up to 4,954 ft (1,510 m), encircle a lake of 4.25 sq mi (11 sq km) that occupies the caldera. The volcano erupted in 1875 and again in 1961.

Asmara Vas-ma-ra\ City (pop., 2002 est.: 500,600), capital of Eritrea.

It lies on the northern tip of the Ethiopian Plateau at an elevation of 7,628 ft (2,325 m). Its Red Sea port, Massawa, is 40 mi (65 km) northeast. Formerly a hamlet of the Tigre people, Asmara became the capital of the Italian colony of Eritrea in 1900. It was under British control from 1941 until Eritrea's federation with Ethiopia in 1952 and became the capital of independent Eritrea in 1993. It is an agricultural marketplace.

Aso \'a-so\. Mount Japanese Aso-san Volcanic mountain, central Kyushu island, Japan. The highest of its five peaks is about 5,223 ft (1,592 m) tall. It has one of the largest active craters in the world, measuring 7 1 mi (114 km) in circumference; its caldera marks the original crater and contains an active volcano and hot springs. The crater is inhabited; its pastures are used for cattle raising and dairy farming. The volcano is at the centre of Aso-Kuju National Park.

Asoka See Ashoka

asp Anglicized form of aspis, the name used in classical antiquity for a venomous snake, probably the Egyptian cobra (Naja haje). The asp was the symbol of royalty in Egypt, and its bite was used for the execution of criminals in Greco-Roman times. Cleopatra is said to have killed herself with an asp.

asparagine \3-'spar-3-jen\ One of the nonessential amino acids, widely distributed in plant proteins and closely related to aspartic acid. First isolated in 1806 from asparagus, it is used in medicine and biochemical research.

asparagus Any plant of the genus Asparagus (lily family), which contains about 300 species native from Siberia to southern Africa. The best-

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known and economically most important species is the garden asparagus (A. officinalis), cultivated as a green vegetable for its succulent spring stalks. Several African species are grown as ornamental plants. The poisonous species prized for their delicate and graceful foliage are A. plumosus (the feathery asparagus fern, or florists' fern — not a true fern), A. sprengeri, and A. asparagoides.

aspartame Vas-par-.tamX Synthetic organic compound (a dipeptide) of phenylalanine and aspartic acid. It is 150-200 times as sweet as cane sugar and is used as a nonnutritive tabletop sweetener and in low-calorie prepared foods (brand names NutraSweet, Equal) but is not suitable for baking. Because of its phenylalanine content, persons with phenylketonuria must avoid it. Though it is approved by the U.S. Food and Drug Administration and other regulatory authorities around the world, its safety even for those without the disease remains controversial. See also saccharin.

aspartic acid One of the nonessential amino acids, found in many proteins and closely related to asparagine. It is used in medical and biochemical research, as an organic intermediate, and in various industrial applications. It is one of the two components of aspartame.

Aspasia Vas-'pa-shoX (fl. 5th century bc) Mistress of Pericles and a vivid figure in Athenian society. Originally from Miletus, she lived with Pericles from c. 445 bc until his death in 429. Because she was not a citizen, their son was initially denied civic rights. Though an intellectual admired by Socrates, she endured public attacks, especially in comic theatre, for her private life and her supposed influence on Pericles’ foreign policy.

Aspen City (pop., 2000: 5,914), western central Colorado, U.S. It is located on the Roaring Fork River at the edge of the White River National Forest, at an altitude of 7,907 ft (2,410 m). Founded by prospectors c. 1878, it was a booming silver-mining town by 1887 but declined rapidly after silver prices collapsed in the early 1890s. Its revival as a ski resort began in the late 1930s, and it is now a popular tourist town; it is also known for its cultural festivals, notably the Aspen Music Festival.

aspen Any of three tree species of the genus Populus, of the willow family: P. tremula (the common European aspen), P. tremuloides (the American quaking, or trembling, aspen), and P. grandidentata (the American big-tooth aspen). Native to the Northern Hemisphere, aspens are known for the fluttering of their leaves in the slightest breeze. Aspens grow farther north and higher up the mountains than other Populus species. All aspens have a smooth, gray-green bark, random branching, rich green leaves that turn brilliant yellow in fall, and catkins that appear before the leaves in spring.

Aspendus \as-'pen-d9s\ Ancient city, Pamphylia (now southwestern Turkey). It was a wealthy city by the 5th century bc. Occupied by Alexander the Great in 333 bc, it was taken by the Romans in 133 bc. It is noted for its Roman ruins, including a huge theatre designed by the architect Zeno in honour of the emperor Marcus Aurelius.

Aspergillus \,as-p9r-'jil-9s\ Any fungus of the genus Aspergillus of the Fungi Imperfecti (form-class Deuteromycetes). Species for which the sexual phase is known are placed in the order Eurotiales. A. niger causes black mold on some foods; A. niger, A. flavus, and A. fumigatus cause aspergillosis in humans. A. oryzae is used to ferment SAKE, and A. wentii to process soybeans.

asphalt Black or brown petroleum-like material that has a consistency varying from viscous liquid to glassy solid. It is obtained either as a residue from the distillation of petroleum or from natural deposits. Asphalt consists of compounds of hydrogen and carbon with minor proportions of nitrogen, sulfur, and oxygen. It softens when heated and is elastic under

certain conditions. Used principally in road surfacing, asphalt is also used for roofs, coatings, floor tilings, and waterproofing, and in industrial products.

asphodel Vas-f9-,del\ Any of several flowering plants belonging to the lily family. This common name is variously applied and thus much misunderstood. The asphodel of the poets is often a narcissus; that of the ancients is either of two genera, Asphodeline or Asphodelus. Asphodels are hardy herbaceous perennials with narrow leaves and an elongated stem bearing a handsome spike of white, pink, or yellow flowers. Bog asphodel (Narthecium ossifragum) is a small herbaceous plant that grows in boggy places in Britain.

asphyxia \as-'fik-se-o\ Lack of exchange of oxygen and carbon dioxide due to respiratory failure or disturbance, resulting in insufficient brain

oxygen, which leads to unconsciousness or death. Causes include strangulation, drowning, and carbon monoxide poisoning. Breathing in food or fluid can cause obstruction of the airway and pulmonary collapse. Emergency resuscitation usually includes cardiopulmonary resuscitation.

aspidistra \ 1 as-po-'dis-tr3\ Any plant of the genus Aspidistra (lily family), native to eastern Asia and known for ornamental foliage. The only cultivated species is a houseplant commonly known as cast-iron plant {A. elatior, or A. lurida), which has long, stiff, pointed evergreen leaves that are capable of withstanding temperature extremes, dust, smoke, and other harsh conditions. The solitary, bell-shaped flowers, which are usually lilac in colour but sometimes brown or green, are borne at the base of the plant. The fruits are small berries.

aspirin Common name of acetylsalicylic acid, an organic compound introduced in 1899. The ester of salicylic acid and acetic acid, it inhibits production of prostaglandins in the body. Its analgesic, fever-reducing, and anti-inflammatory effects make it useful in treating headaches, muscle and joint aches, arthritis pain, and the symptoms of mild fevers and infections. It also has anticoagulant activity and is taken in low doses by coronary heart disease patients to prevent heart attack. Prolonged use may cause stomach bleeding and peptic ulcer, and its use in children with fever has been linked to Reye syndrome. See also acetaminophen; ibuprofen; NSAID.

Aspiring, Mt. See Mount Aspiring National Park

Asplund, (Erik) Gunnar (b. Sept. 22, 1885, Stockholm, Swed. — d. Oct. 20, 1940, Stockholm) Swedish architect. His work shows the historically important transition from Neoclassical architecture to Modernism. By 1928, influenced by Le Corbusier, he had turned from a retrospective style to a new vision for architecture. He planned the Stockholm Exposition of 1930, a place of futuristic, glassy pavilions that had a significant influence on subsequent exhibition architecture. His Woodland Crematorium, Stockholm (1935-40), with its spare Neoclassical colonnade surrounded by meadows, is admired by Classicists and Modernists alike.

Asquith, H(erbert) H(enry), 1 st earl of Oxford and Asquith

(b. Sept. 12, 1852, Morley, Yorkshire, Eng. — d. Feb. 15, 1928, Sutton Courtenay, Berkshire) British politician and prime minister (1908-16).

Elected to the House of Commons in 1886, he served as home secretary (1892-95). A leader of the Liberal Party, he became prime minister in 1908. His plan to limit the powers of the House of Lords was enacted by the Parliament Act of 1911. He led Britain in the early years of World War I, but domestic crises combined with British losses in the war led to widespread dissatisfaction. He resigned in 1916 but remained leader of his party until 1926.

ass or wild ass Either of two species of small, sturdy equines. Asses are 3-5 ft (90-150 cm) high at the shoulder. The African wild ass, or true ass (Equus asinus) is bluish gray to fawn; the Asiatic wild ass, or half-ass (E . hemionus) is reddish to yellow-gray. The half-ass differs from the true ass in that it has extremely long, slender legs, shorter ears, and larger hooves. The true ass has the alternating “hee-haw” bray. Desert dwellers, wild asses often inhabit regions that cannot support other large mammals. They are very swift runners. See also donkey.

Assad \'a-sad\, Hafiz al- (b. Oct. 6, 1930, Qardaha, Syria — d. June 10, 2000, Damascus) President of Syria (1971-2000). He joined the Ba'th Party in 1946 and in 1955 became an air force pilot. He became air force commander (1963) after helping the Ba'thists gain power. After participating in a military coup in 1966, he became minister of defense. He led a coup in 1970 to replace his political mentor, Salah al-Jadld, as Syria’s leader. He joined Egypt in a surprise attack on Israel (1973) but nearly 20 years later (1991) participated in peace negotiations with Israel in an effort to regain the Golan Heights, taken by Israel in the Six-Day War of 1967. A longtime foe of Iraqi leader Saddam Hussein, he supported the Western alliance against Iraq in the Persian Gulf War (1990—91). He was succeeded by his son Bashshar.

As sal \a-'sal\. Lake Saline lake, central Djibouti. Situated at 515 ft (157 m) below sea level, it is the lowest point in Africa. It has been used for quarrying salt.

Assam \a-'sam\ State (pop., 2001 prelim.: 26,638,407), northeastern India. With an area of 30,285 sq mi (78,438 sq km), Assam borders Bhutan and Bangladesh and Arunachal Pradesh, Nagaland, Manipur, Mizoram, Meghalaya, and West Bengal states; its capital is Dispur. A strong inde-

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pendent kingdom was founded there in the 13th century by invaders from Myanmar (Burma) and China; it reached its zenith in the early 1 8th century. The British took control in the early 19th century. In the division of India (1947), Assam lost some territory to Pakistan. Beginning in the 1960s, four new states — Nagaland, Meghalaya, Mizoram, and Arunachal Pradesh — were created from land within Assam. The Brahmaputra River valley is its dominant physical feature. The population consists of Indo-Iranian and Asian peoples; the most widely spoken language is Assamese.

Assassin properly Nizariyyah Byname for any member of a sub-

sect of Isma'ill Shl'ite Muslims who operated in parts of Iran and Syria from the 1 1th to the 13th century. The order takes its name from the purported use of hashish to induce ecstatic visions of paradise among its devotees (hashshashun, “hashish smokers” — whence is derived the English term) before they set out to face martyrdom. The Assassins operated out of series of mountain fortresses and, seeing assassination as a religious duty, engaged in a long campaign of murder against members of the Sunnite community, including numerous officials of the 'Abbasid and Seljuq dynasties, and others. The Assassins’ power was finally broken by the Mongols, who captured the great Assassin stronghold of 'Alamut in Iran in 1256. The Syrian branch was destroyed by the Mamluk Baybars I in 1271-73. Leadership of the Nizari order continued until modern times in the line of the Aga Khans, a family prominent worldwide as philanthropists and public servants.

assassin bug Any of about 4,000 insect species (family Reduviidae) characterized by a thin, necklike structure connecting the narrow head to the body. Many species are common to North and South America. Ranging in size from 0.5 to 1 in. (13-25 mm), assassin bugs use their short, three-segmented beak to suck body fluids from their victims. Most assassin bugs prey on other insects; some, however, suck blood from vertebrates, including humans, and transmit diseases. One species, the large assassin bug, defends itself by accurately “spitting” saliva toxic enough to blind a human.

assassin fly See robber fly

assault and battery Related but distinct crimes. Battery is the unlawful application of physical force to another; assault is an attempt to commit battery or an act that may reasonably cause fear of imminent battery. With manslaughter and murder (see homicide), these concepts are articulated to protect against rude and undesired physical contact or the threat of it. Battery requires no minimum degree of force, nor does it need to be applied directly; administering poison and transmitting a disease may both be battery. Accidents and ordinary negligence are not, nor is reasonable force used in the performance of duty (e.g., by a police officer). See also RAPE.

assault rifle Military firearm that is chambered for ammunition of reduced size or propellant charge and has the capacity to switch between semiautomatic and fully automatic fire. Light and portable, yet able to deliver a high volume of fire with reasonable accuracy at modern combat ranges of 1,000-1,600 ft (300-500 m), assault rifles have become the standard infantry weapon of modern armies. Their ease of handling makes them ideal for mobile assault troops crowded into personnel carriers or helicopters, as well as for guerrilla fighters engaged in jungle or urban warfare. Widely used assault rifles are the U.S. Ml 6, the Soviet Kalashnikov (the AK-47 and modernized versions), the Belgian LAL and LNC, and the German G3.

assaying Va-sa-iqX In chemical analysis, the process of determining proportions of metal, particularly precious metal, in ores and metallurgical products. The most important assaying technique grew largely out of the experiments of the ancient alchemists and goldsmiths. Precious metals tend to occur as scattered particles randomly distributed, so a large sample of ore is required. Such large samples (typically containing gold, silver, and lead) are still most economically assayed by this ancient method, which involves several steps of heating and cooling. More

sophisticated recent methods, such as spectrochemical analysis, are not suited to assaying precious metal ores because the samples of the inhomogeneous ore that must be used are larger than the instruments can handle. See also parting.

assemblage \,a-sam-'blazh\ Three-dimensional construction made from household materials such as rope and newspapers or from any found materials. The term, coined by Jean Dubuffet in the 1950s, has been applied to collage, photomontage, and sculptural assemblage. The Dadaists and Surrealists produced ready-made assemblages and elevated them to art by simply exhibiting them. Later artists who have worked with the technique include Louise Nevelson and Robert Rauschenberg.

Assemblies of God Largest Pentecostal denomination in the U.S. It was formed in 1914 in Hot Springs, Ark., by the union of several small Pentecostal groups. The Assemblies of God emphasize the centrality of the Bible in Christian faith and worship. Instead of sacraments, the Assemblies have two ordinances, baptism by total immersion and the Lord’s Supper. Personal sanctification is believed to happen gradually rather than instantaneously, and millennial doctrines dealing with Christ’s Second Coming and the establishment of the Kingdom of God are of great importance. The Assemblies of God have been very active in mission work in the U.S. and overseas. See also millennialism, Pentecostalism.

assembly language Type of low-level computer programming language consisting mostly of symbolic equivalents of a particular computer’s machine language. Computers produced by different manufacturers have different machine languages and require different assemblers and assembly languages. Some assembly languages can be used to convert the code that programmers write (source code) into machine language (readable by the computer), and have functions to facilitate programming (e.g., by combining a sequence of several instructions into one entity). Programming in assembly languages requires extensive knowledge of COMPUTER ARCHITECTURE.

assembly line Industrial arrangement of machines, equipment, and workers for continuous flow of workpieces in mass-production operations. An assembly line is designed by determining the sequences of operations for manufacture of each component as well as the final product. Each movement of material is made as simple and short as possible, with no cross flow or backtracking. Work assignments, numbers of machines, and production rates are programmed so that all operations performed along the line are compatible. Automated assembly lines (see automation) consist entirely of machines run by other machines and are used in such continuous-process industries as petroleum refining and chemical manufacture and in many modern automobile-engine plants. See also Henry Ford, interchangeable parts, Taylorism.

assessment Process of setting a value on real or personal property, usually for the purpose of taxation. It is carried out either by central government agencies or by local officials. Property may be assessed on the basis of its annual rental value, as in Britain, or its capital value, as in the U.S. Various methods are used to determine capital value, including analysis of market data to estimate the property’s current market price, estimation of the cost of reproducing the property minus accrued depreciation, and capitalization of the property’s earnings.

assessor One with special knowledge of a subject who is appointed or elected to assist a judge or magistrate in deciding a legal matter. In the U.S., the term also designates an official who evaluates property for the purposes of taxation. Assessors were appointed in the late 19th century throughout Europe to try to limit the influence of the jury system, which had been introduced in the wake of the French Revolution. Assessors thus represented a return to the civil-law traditions of Europe. In Britain and the U.S., assessors came to be used in labour and maritime courts as well as in some other civil jurisdictions.

assimilation See culture contact

Assiniboia No-.sin-s-'boi-oN Early region, western Canada. Named for the Assiniboin Indians, it was an area with indefinite boundaries, controlled by the Hudson's Bay Co. c. 1811-70. It included present-day southern Manitoba and, until 1818, the Red River Valley in present-day North Dakota and Minnesota. It was incorporated into Manitoba in 1870. In 1882 the Canadian government created another district of Assiniboia as part of the old Northwest Territories. In 1905 this district was divided between Alberta and Saskatchewan.

Assiniboin Xo-.sin-o-'boi-onV or Nakota North American Plains Indian people living mostly on reservations in Montana, U.S., and Saskatchewan and Alberta, Can. They speak a Siouan language. Their name is an Ojibwa word meaning “those who cook with stones.” They were divided into bands, each with its own chief and council, and were generally friendly with whites. The bands moved their camps frequently in pursuit of migrating buffalo. Prowess in war consisted of taking scalps and horses and of touching the enemy (“counting coups”) during battle. Their numbers were severely reduced by smallpox in the 1820s and ’30s, after which most

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were placed on reservations. Some 3,900 people claimed sole Assiniboin descent in the 2000 U.S. census.

There are somewhat fewer in Canada.

Assiniboine Vo-'sin-o-.bohA River River, southern Canada. Rising in Saskatchewan, it flows southeast across Manitoba into the Red River of the North at Winnipeg. It is about 665 mi (1,070 km) long and has two tributaries, the Qu'Appelle and the Souris. Explored by Pierre Ia Verendrye in 1736, it later served as

a route to the plains by colonists from Red River Settlement.

Assi s, Joaquim Maria
Machado de See Joaquim M.

Machado de Assis

assistance, writ of General search warrant used by the British in the American colonies. The warrants authorized customhouse officers, with the assistance of a sheriff, to search any house or ship for smuggled goods, without requiring them to specify the place or the goods. The legality of the writs was challenged by the colonists in the 1760s, and they became a major grievance in the years leading up to the American Revolution. See also James Otis.

assize \9-‘siz\ In law, a session, or sitting, of a court. It originally referred to a judicial inquest in which a panel of men conducted an investigation. It was later applied to special sessions of high courts in England and France. Assize courts were abolished in most countries in the 20th century, but in France they are still the courts of first instance in the handling of serious crimes.

Associated Press (AP) Cooperative news agency, the oldest and largest in the U.S. and long the largest in the world. Its beginnings trace to 1848, when six New York City newspapers pooled their efforts to finance a telegraphic relay of foreign news brought by ships to Boston. In 1892 the modern AP was set up under the laws of Illinois; several years later it moved to New York. Its restrictive controls on new memberships were ended with federal antitrust prosecution in the 1940s. AP was the first agency to devote a news wire to sports coverage (1946), and it distributes business news through a partnership with Dow Jones & Co., Inc. More than 15,000 organizations worldwide obtain news, photographs, and illustrations from the agency. The AP Stylebook has become a standard in many journalistic organizations.

association In psychology, the process of forming mental connections or bonds between sensations, ideas, or memories. Though discussed by the ancient Greeks (in terms of similarities, contrasts, and contiguities), the “association of ideas” was first proposed by John Locke and subsequently examined by David Hume, John Stuart Mill, Herbert Spencer, and William James. Ivan Pavlov used objective methods to study the phenomenon, resulting in his identification of the conditioned reflex (see conditioning). Within psychoanalysis, the therapist encourages “free association” in order to help identify latent conflicts. Practitioners of Gestalt psychology and others have criticized associationist theories as too all-embracing, while some theorists of cognitive psychology have made it central to their theory of memory.

association football See football

Association of Caribbean States (ACS) Trading bloc composed of 25 countries of the Caribbean basin. Responding to a proposal by Pres. Bill Clinton for a Free Trade Area of the Americas (FTAA), existing Caribbean-area trading blocs joined forces in 1995 to strengthen their economic position and ease future integration into the FTAA. Prominent

in the ACS are the Caricom countries (13 English-speaking countries and Suriname), which have been struggling toward a single market and economy along the lines of the European Union. The ACS has addressed such issues as unifying responses to natural disasters, ending the U.S. embargo of Cuba, and ending shipments of nuclear materials through the Panama Canal.

Association of Southeast Asian Nations See ASEAN

associative law Two closely related laws of number operations. In symbols, they are stated: a + (b + c) = (a + b) + c, and a(bc) = (ab)c . Stated in words: The terms or factors may be associated in any way desired and the result will be the same. This holds for the numbers generally encountered: positive and negative, integral and fractional, rational and irrational, real and imaginary. Exceptions occur (e.g., in nonassociative algebras and divergent infinite series). See also commutative law, distributive law.

Assos See Assus

assumpsit \3-'s9mp-sit\ (Latin: “he has undertaken”) In common law, an action to recover damages for breach of contract, especially an implied or quasi contract. It developed in early English law as a form of recovery for the negligent performance of an undertaking (e.g., failing to protect from damage another’s goods in one’s care). Eventually, it came to cover broader claims regarding failure to keep a promise. It remains available as a contractual remedy in some U.S. jurisdictions.

Assus or Assos Ancient Greek city, southern Troas (now northwestern Turkey). It was founded in the 1st millennium bc on the Gulf of Edremit, opposite the island of Lesbos. It was long an important city and port. Aristotle taught there 348-345 bc, and it was the birthplace of the philosopher Cleanthes (3317-232? bc).

Assyria Ancient empire, southwestern Asia. It grew from a small region around Ashur (in modem northern Iraq) to encompass an area stretching from Egypt to Anatolia. Assyria may have originated in the 2nd millennium bc, but it came to power gradually. Its greatest period began in the 9th century bc, when its conquests reached the Mediterranean Sea under Ashurnasirpal II (883-859), and again c. 746-609 bc, during the Neo-Assyrian empire, when it conquered much of the Middle East. Its greatest rulers during the latter period were Tiglath-pileser III, Sargon II, Sennacherib, and Ashurbanipal. Famous for their cruelty and fighting prowess, the Assyrians were also monumental builders, as shown by archaeological finds at Nineveh, Ashur, and Calah. The opulence of Ashurbanipal’ s court at Nineveh became legendary. Artistically, the Assyrians were particularly noted for their stone bas-reliefs. The kingdom was finally vanquished in 612-609 bc by a coalition of Media and Babylonia (Chaldea).

Assyro-Babylonian language See Akkadian language

Astaire, Fred orig. Frederick Austerlitz (b. May 10, 1899, Omaha, Neb., U.S. — d. June 22,

1987, Los Angeles, Calif.) U.S. dancer and singer of stage and movies. At age seven he began his popular vaudeville dance act with his

sister Adele, and they made their Broadway debut in 1917; they continued dancing in stage hits until Adele retired in 1932. Astaire’s successful film appearances with Ginger Rogers began with Flying Down to Rio (1933) and continued until 1939.

In the 1940s and 1950s he danced on-screen with Eleanor Powell, Cyd Charisse, and Judy Garland. His singing, though untrained, was admired by the finest songwriters of his time. He retired in 1971 but occasionally appeared in films and on television. His combination of sophisticated, seemingly effortless grace and technical virtuosity revolutionized popular-dance performance.

Astana formerly (1992-98) Aqmola or Akmola \ak-'mo-b\ or(1961-92) Tselinograd \'tsi-'le-n9- l grat\ City (pop., 1999: 319,318), capital of Kazakhstan. Situated on the banks of the Ishim River in north-central Kazakhstan, it was founded in 1 824 as a Russian military outpost. The city’s importance was enhanced by its location at the junction of the Trans-Kazakhstan and South Siberian railways. It is in the centre of a mineral-rich steppe region. In 1994 the Kazakh government began to transfer the national capital from Almaty to Astana, changing the city’s name in 1998.

Astarte \a-'star-te\ or Ashtart \'ash-,tart\ Goddess of the ancient Middle East and chief deity of the Mediterranean seaports of Tyre, Sidon,

Assiniboin, placating the spirit of a slain eagle, photograph by Edward S. Curtis, 1 908; from The North American Indian

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Astaire in Top Hat, 1 935

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and Elath. Astarte shared many qualities, and perhaps a common origin, with her sister Anath. The goddess of love and war, Astarte was worshiped in Egypt and in Canaan, as well as among the Hittites. Her Akkadian counterpart was Ishtar. She is often mentioned in the Bible under the name Ashtaroth; Solomon is said to have worshipped the goddess, and Josiah destroyed the shrines dedicated to her. In Egypt she was assimilated with Isis and Hathor; in the Greco-Roman world she was assimilated with Aphrodite, Artemis, and Juno.

aster Any of various chiefly fall-blooming, leafy-stemmed herbaceous plants (Aster and closely related genera) in the composite family, often with showy flowers. Included among the asters are many perennial wildflowers and hundreds of garden varieties.

asteroid Any of the many small rocky objects found mainly in a flat ring, or belt, between the orbits of Mars and Jupiter. It is thought that the gravitational influence of what became Jupiter kept the asteroids from aggregating into a single planet while the solar system was forming. Also called minor planets, asteroids are smaller than any of the nine major planets; only about 30 are more than 125 mi (200 km) across. Ceres is the largest known asteroid. Millions of boulder-sized asteroidal fragments are thought to exist in the solar system. Asteroids or their fragments regularly strike Earth, plunging through the atmosphere as meteors to reach its surface (see meteorite). Asteroids appear to be composed of carbonaceous, stony, and metallic (mainly iron) materials. See also Earth-crossing asteroid; Trojan asteroids.

asthenosphere \as-'the-n3-,sfir\ Zone of the Earth’s mantle lying beneath the lithosphere, believed to be much hotter and more fluid than the lithosphere. The asthenosphere is thought to extend from about 60 mi (100 km) to about 450 mi (700 km) below the Earth’s surface.

asthma Vaz-mo\ Chronic disease with attacks of shortness of breath, wheezing, and coughing from constriction and mucous-membrane swelling in the bronchi (air passageways in the lungs). It is caused primarily by allergy or respiratory infection. Secondhand smoke can cause asthma in children. Asthma is common and runs in families; predisposition may be hereditary. In established asthmatics, exercise, stress, and sudden changes in temperature or humidity can bring on attacks. Attacks usually last from a half hour to several hours; severe attacks can be fatal. Corticosteroids can control asthma; injections of epinephrine can relieve acute attacks. Prevention involves avoiding exposure to allergens.

astigmatism No-'stig-mo-.ti-zonA Lack of symmetry in the curvature of the cornea or, rarely, the lens of the eye. The unequal curvatures spread light rays, preventing them from being sharply focused at a point on the retina, causing blurring of part of the image. The effect of astigmatism can also be produced by misalignment of the lens. Astigmatic vision is corrected by means of lenses (see contact lens, eyeglasses) that refract the light rays to the proper degree in the opposite direction of that produced by the defects in curvature.

Astor, John Jacob orig. Johann Jakob Astor (b. July 17, 1763, Waldorf, Ger. — d. March 29, 1848,

New York, N.Y., U.S.) German-born U.S. fur magnate and financier. After emigrating from Germany at age 17,

he opened a fur-goods shop in New York c. 1786. By 1800 he was a leader in the fur trade, and he established the American Fur Co. He controlled the fur trade with China (1800-17) and in the Mississippi and Missouri valleys (in the 1820s) before selling his interests in 1834.

His investment in New York City real estate became the foundation of the family fortune. At his death, Astor was the wealthiest person in the U.S. ; he willed $400,000 to found what became the New York Public Library.

His son, William B. Astor (1792-1875), greatly expanded the family real-estate holdings, building more than 700 stores and dwellings in the city.

Astrakhan \ , as-tro- l kan\ City (pop., 2002: 506,400), southwestern Russia. It is situated on several islands in the delta of the Volga River. It was the capital of a Tatar khanate that became independent of the Golden Horde in the 13th century, and its location on caravan and water routes made it a trading centre. Ivan IV (the Terrible) conquered Astrakhan in 1556, giving Russia control of the Volga. The Turks burned the city in 1569. It served as the base for the campaign of Peter I (the Great) against Persia and later was given special trade privileges. Sites of interest include a fortress and a cathedral.

astrolabe Type of early scientific instrument used for reckoning time and for observational purposes.

Astrolabes can be traced to the 6th century ad; they came into wide use in Europe and the Islamic world in the early Middle Ages and were adopted by mariners by the mid- 15 th century. One widely used variety, the planispheric astrolabe, can be regarded as a rudimentary analog computer. It enabled astronomers to calculate the positions of the Sun and prominent stars with respect to both the horizon and the meridian.

astrology Divination that consists of interpreting the influence of stars and planets on earthly affairs and human destinies. In ancient times it was inseparable from astronomy. It originated in Mesopotamia (c. 3rd millennium bc) and spread to India, but it developed its Western form in Greek civilization during the Hellenistic period. Astrology entered Islamic

culture as part of the Greek tradition and was returned to European culture through Arabic learning during the Middle Ages. According to the Greek tradition, the heavens are divided according to the 12 constellations of the zodiac, and the bright stars that rise at intervals cast a spiritual influence over human affairs. Astrology was also important in ancient China, and in imperial times it became standard practice to have a horoscope cast for each newborn child and at all decisive junctures of life. Though the Copernican system shattered the geocentric worldview that astrology requires, interest in astrology has continued into modem times and astrological signs are still widely believed to influence personality.

astronaut Person trained to pilot a spacecraft, operate any of its systems, or conduct research aboard it during spaceflights. The term commonly refers to those participating in U.S. space missions; cosmonaut is the Russian equivalent. Extensive training, including classroom study of technical subjects as well as practice in computer-controlled simulators and full-sized mock-ups of spacecraft to experience free fall, prepares astronauts physically and psychologically for space missions. Astronauts also learn to use the control, communication, and life-support systems of any given spacecraft and conduct difficult flight operations. See also Edwin Aldrin; Neil Armstrong; Guion S. Bluford, Jr.; Yury A. Gagarin; John H. Glenn, Jr.; Mae Jemison; Sally Ride; Alan B. Shepard, Jr.; Valentina Tereshkova.

astronomical unit (AU) Length of the semimajor axis of Earth’s orbit around the Sun, 92,955,808 mi (149,597,870 km), often defined simply as the average distance from Earth to the Sun. Direct measurement through the parallax method cannot be used for accurate determinations, because the Sun’s glare blots out the light of the background stars necessary to make the measurement. The most precise values have been obtained by measuring the distance from Earth to other objects orbiting the Sun. This indirect method requires an accurate proportional mathematical model of the solar system; once the distance to one planet or other object is determined, then the distance to the Sun can be calculated.

astronomy Science dealing with the origin, evolution, composition, distance, and motion of all bodies and scattered matter in the universe. The most ancient of the sciences, it has existed since the dawn of recorded civilization. Much of the earliest knowledge of celestial bodies is often credited to the Babylonians. The ancient Greeks introduced influential cosmological ideas, including theories about the Earth in relation to the rest of the universe. Ptolemy’s model of an Earth-centred universe (2nd

John Jacob Astor, detail of an oil painting by Gilbert Stuart, 1 794; in the Brook Club, New York.

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century ad) influenced astronomical thought for over 1,300 years. In the 16th century, Nicolaus Copernicus assigned the central position to the Sun (see Copernican system), ushering in the age of modern astronomy. The 17th century saw several momentous developments: Johannes Kepler's discovery of the principles of planetary motion, Galileo's application of the telescope to astronomical observation, and Isaac Newton's formulation of the laws of motion and gravitation. In the 19th century, spectroscopy and photography made it possible to study the physical properties of planets, stars, and nebulae, leading to the development of astrophysics. In 1927 Edwin Hubble discovered that the universe, hitherto thought static, was expanding (see expanding universe). In 1937 the first radio telescope was built. The first artificial satellite, Sputnik, was launched in 1957, inaugurating the age of space exploration; spacecraft that could escape Earth's gravitational pull and return data about the solar system were launched beginning in 1959 (see Luna; Pioneer). See also big bang; cosmology;

GAMMA-RAY ASTRONOMY; INFRARED ASTRONOMY; RADIO AND RADAR ASTRONOMY; ULTRAVIOLET ASTRONOMY; X-RAY ASTRONOMY.

astrophysics Branch of astronomy concerned mainly with the properties and structures of cosmic objects, including the universe as a whole. Starting in the 19th century, spectroscopy and photography were applied to astronomical research, making it possible to study the brightness, temperature, and chemical composition of cosmic objects. It was soon realized that the properties of these bodies could be fully understood only in terms of the physics of their atmospheres and interiors. X-ray astronomy, GAMMA- RAY ASTRONOMY, INFRARED ASTRONOMY, ULTRAVIOLET ASTRONOMY, and RADIO and radar astronomy are all basically concerned with extending electromagnetic coverage beyond the visible spectrum to constrain the physical characteristics of astronomical objects.

Astruc \as-trE£k\ of Lunel orig. Abba Mari ben Moses ben Joseph (b. 1250?, Lunel, near Montpellier, France — d. after 1306) French Jewish scholar. He revered Maimonides but argued that Maimonides' followers undermined faith by reading the Bible allegorically. Through letters he persuaded the powerful rabbi Solomon ben Abraham Adret (1235-1310) of Barcelona, Spain, to forbid the study or teaching of science and philosophy by those under 25 (1305). The resulting controversy almost split the Jewish communities of France and Spain. A schism was prevented when Philip IV of France expelled the Jews from France in 1306, and Astruc settled in Majorca.

Asturias \as-'tur-e-os\ Autonomous community (pop., 2001: 1,062,998) and province, on the Bay of Biscay, northwestern Spain. It occupies an area of 4,094 sq mi (10,604 sq km); its capital is Oviedo. Coextensive with the historical principality of Asturias, it is largely covered by mountains that isolate it from other Spanish provinces. Its population and industries are concentrated in the Nalon River valley, whose extensive coalfields make the province Spain's mining centre. Conquered by the Romans under Augustus in 25 bc, it was later ruled by the Visigoths. It became part of the kingdom of Leon on the accession of Alfonso III in 866. It was made a principality in 1388, a province in 1838, and an autonomous community in 1981.

Asturias \as-'tur-e-9s\, Miguel Angel (b. Oct. 19, 1899, Guatemala City, Guat. — d. June 9, 1974,

Madrid, Spain) Guatemalan poet, novelist, and diplomat. He moved to Paris in 1923 and became a Surrealist under the influence of Andre Breton. His first major works appeared in the 1930s. He began his diplomatic career in 1946; it culminated in his serving as ambassador to France 1966-70. Asturias's writings combine a Mayan mysticism with an epic impulse toward social protest, especially against U.S. and oligarchic power. In Men of Maize (1949), often considered his masterpiece, he depicts the seemingly irreversible wretchedness of the Indian peasant.

Other major novels, some of which employ the style of magic realism, are El Sehor Presidente (1946), a fictional denunciation of Guatemala's dictator; The Cyclone (1950); The Green Pope (1954); and The Eyes of the Interred (1960). He won the Nobel Prize for Literature in 1967.

Asuncion \a-,sun-'syon\ in full Nuestra Senora de la Asuncion

City (pop., 2002 prelim.: 513,339), capital of Paraguay. It lies on the Paraguay River near its confluence with the Pilcomayo River. Founded in 1537 by Spanish coNQUiSTADORes, it replaced Buenos Aires as the headquarters of Spanish colonial activities in eastern South America during the period of the latter's depopulation (1541-80). In 1731 Asuncion was the site of one of the first major rebellions against Spanish rule. The city declared independence from both Spain and Argentina in 1811. Today it dominates social, cultural, and economic trends in Paraguay.

Asvaghosa V.ash-vo'-go-shoN (b. ad 80?, Ayodhya, India — d. 150?, Peshawar) Indian philosopher and poet considered the father of Sanskrit drama. Born a Brahman, he opposed Buddhism until a debate with a Buddhist scholar led to his conversion. Asvaghosa became known as a brilliant orator, and he spoke on Mahayana at the fourth Buddhist council. He is considered India's greatest poet before Kalidasa. Works attributed to him include the Buddhacarita ("Life of the Buddha") and the Mahalankara ("Book of Glory").

asvamedha V.ash-vo-'ma-doV Rite of the Vedic religion in ancient India, performed by a king to celebrate his supremacy. A stallion was selected and allowed to roam freely for a year under the protection of a royal guard. It was said to symbolize the progress of the sun and the power of the king. If it was not captured during the year, it was brought back to the capital along with the rulers of lands it had entered. It was then sacrificed at a public ceremony, and the king assumed the title of universal monarch. The Buddha condemned the practice, but it was revived in the 2nd century bc and may have continued as late as the 11th century ad.

Aswan City (pop., 1996 est.: 219,017), southeastern Egypt. It lies on

the Nile River just north of Lake Nasser. In ancient times it was the southern frontier of pharaonic Egypt. Later known as Syene, it served as a frontier garrison post for the Romans, Ottomans, and British. Modem Aswan is located near the old Aswan Dam (completed 1902) and the Aswan High Dam.

Aswan High Dam Dam across the Nile River, north of Aswan, Egypt. Built 4 mi (6 km) upstream from the earlier Aswan Dam (1902), it is 364 ft (111 m) high and 12,562 ft (3,830 m) long. Differences with Gamal Abdel Nasser led the U.S. and Britain to withdraw their financial support of the project in 1956, whereupon Nasser turned to the Soviet Union for assistance. The dam, completed in 1970, impounds the reservoir Lake Nasser and controls the annual Nile flood, releasing flood waters when needed for irrigation; it also enables the production of great amounts of electric power. Its construction necessitated the relocation of the ancient Abu Simbel ruins.

asylum Protection from arrest and extradition given to political refugees by a country or by an embassy that has diplomatic immunity. No one has a legal right to asylum, and the sheltering state, which has the legal right to grant asylum, is under no obligation to give it. It is thus a right of the state, not the individual. Its traditional use has been to protect those accused of political offenses such as treason, desertion, sedition, and espionage. Beginning in the 20th century, asylum also was granted to those who could demonstrate a significant risk of politically motivated persecution if they returned to their home countries.

asymmetric synthesis Chemical reaction by which unequal amounts of two product isomers are formed. It is normally not possible to synthesize from materials that do not have optical activity (i.e., are not chiral) one stereoisomer of a chiral compound without the other, but use of a chiral auxiliary, such as an enzyme or other catalyst, a solvent, or an intermediate, can force the reaction to produce predominantly or only one isomer. Asymmetric syntheses are often called stereoselective; if one product forms exclusively, it is stereospecific.

asymptote Va-som-.toA In mathematics, a line or curve that acts as the limit of another line or curve. For example, a descending curve that approaches but does not reach the horizontal axis is said to be asymptotic to that axis, which is the asymptote of the curve.

AT&T Inc. formerly American Telephone and Telegraph Co.

U.S. telecommunications corporation. It was established as a subsidiary of Bell Telephone Co. (founded by Alexander Graham Bell in 1 877) to build long-distance telephone lines and later became the parent company of the Bell System. In the early 20th century it gained a virtual monopoly over the U.S. telecommunications industry, and by 1970 it was the world’s largest corporation. It developed transoceanic radiotelephone links and

Miguel Angel Asturias.

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telephone cable systems and created the Telstar satellite communications system. Years of federal antitrust litigation resulted in 1984 in the divestment by AT&T (nicknamed “Ma Bell”) of its 22 regional telephone companies, which were combined to form seven “Baby Bells”: Nynex, Bell Atlantic, Ameritech, BellSouth, Southwestern Bell Corp. (renamed SBC Corp. in 1995), US West, and Pacific Telesis Group. Although several Baby Bells merged following the Telecommunications Act of 1996, AT&T proceeded to divide its operations into three separate companies: AT&T Corp., Lucent Technologies Inc. (composed of the former operations of Western Electric and Bell Laboratories), and the NCR Corp. In 2005 AT&T was acquired by SBC Corp., which then changed its name to AT&T Inc. Its diversified telecommunications businesses included local and long-distance telephone service, wireless voice and data networks, broadband DSL (Digital Subscriber Line), and Internet communication and Web management services.

Atacama \,a-ta-'ka-ma\ Desert Cool, arid area, north-central Chile. Extending north from the city of Copiapo, the area runs from north to south for a distance of some 600 to 700 mi (1,000 to 1,100 km) and covers most of the Antofagasta region and the northern part of the Atacama region. Because of its location between low coastal mountains and a higher inland range, the region is meteorologically anomalous. Despite its low latitude, summer temperatures average only about 65 °F (18 °C), and, though heavy fogs are common, the desert is one of the driest regions in the world. Some areas receive heavy rain only two to four times a century. For much of the 19th century, the desert was the object of conflicts between Chile, Bolivia, and Peru; after the War of the Pacific (1879-83), Chile emerged with permanent ownership of sectors previously controlled by Peru and Bolivia. For years before the development of synthetic methods of fixing nitrogen, the desert was a chief source of the world’s nitrates.

Atahuallpa \,a-ta-'wal-pa\ (b. c. 1502 — d. Aug. 29, 1533, Cajamarca, Inca empire) Last free-reigning emperor of the Incas. He became ruler after defeating his half brother in what may have been the greatest military engagement in Inca history. The conquistador Francisco Pizarro met Atahuallpa just before the emperor’s triumphal entry into Cuzco and invited him to a feast in his honour. When Atahuallpa and his unarmed retainers arrived, Pizarro ambushed them on horseback with cannons and guns, slaughtered thousands, and took Atahuallpa prisoner. Pizarro accepted Atahuallpa’ s offer of a ransom of a roomful of gold; then, having received 24 tons of gold and silver, he ordered Atahuallpa burned at the stake. The sentence was changed to death by garrote when Atahuallpa agreed to convert to Christianity.

Atalanta \,a-t 3 l-'an-t3\ In Greek mythology, a swift-footed huntress. Born in Boeotia or Arcadia, she was left to
die at birth but was suckled by a bear.

As an adult she took part in the
famous Calydonian boar hunt and

drew first blood. She offered to marry any man who could outrun her in a race, but the losers were required to pay with their lives. One contestant, Hippomenes (or Milanion), obtained three golden apples from Aphrodite to carry in the race. As he dropped them, Atalanta stooped to pick them up, and thus lost the race.

The two were later turned into lions after they desecrated a shrine to Cybele or Zeus.

Atanasoff Vo-'tan-o-.soA, John V(incent) (b. Oct. 4, 1903, Hamilton, N.Y., U.S.— d. June 15, 1995, Frederick, Md.) U.S. physicist. He received his Ph.D. from the University of Wisconsin. With Clifford Berry, he developed the Atanasoff-Berry Computer (1937-42), a machine capable of solving differential equations using binary arithmetic. In 1941 he joined the Naval Ordnance Laboratory; he participated in the atomic bomb tests at Bikini Atoll (1946). In 1952 he established the Ordnance Engineering Co., which he later sold to Aerojet Engineering Corp. In 1973, after a judge voided a patent owned by Sperry Rand Corp. on ENIAC, the Atanasoff-Berry Computer was credited as the first electronic digital computer.

Atargatis \3-'tar-go-tis\ Goddess of northern Syria who was worshiped at Hierapolis, northeast of Aleppo, along with her consort, Hadad. Primarily a goddess of fertility, she was also mistress of the city and its people. She was often depicted wearing a crown and carrying a sheaf of grain, and her throne was supported by lions, suggesting her power over nature. Considered a combination of Anath and Astarte, she also showed kinship with the Anatolian Cybele (Great Mother of the Gods). Merchants and mercenaries carried her cult throughout the Greek world, where she was considered a form of Aphrodite.

Ataturk Vat-s-.tsrkV Mustafa Kemal orig. Mustafa Kemal (b. 1881, Salonika, Greece, Ottoman Empire — d. Nov. 10, 1938, Istanbul, Tur.) Founder of modem Turkey. Dedicated by his father to military service, he graduated near the top of his class in military school. As a young officer, he was critical of the government of the Ottoman Empire and became involved with the Turkish nationalist Committee of Union and Progress. He nevertheless fought for the government during World War I (1914-18), achieving great success against Allied forces during the Dardanelles Campaign. The eventual Allied victory brought British, French, and Italian troops to Anatolia; appointed to restore order there, he used the opportunity to incite the people against the Allied occupation. Greece and Armenia, territorial beneficiaries of the Ottoman defeat, opposed the Turkish nationalists, but Mustafa Kemal overcame all opposition, and the Republic of Turkey was established in 1923. He was given the name Ataturk (“Father of the Turks”) in 1934. He pursued a policy of Westernization and secularization, in which Western styles of dress and appellation were made mandatory, seclusion of women was abolished, and the legal and educa-

tional system was overhauled. See also Enver Pasha; Young Turks.

ataxia \a-'tak-se-9\ Inability to coordinate voluntary muscular movements. In common usage, the term describes an unsteady gait. Hereditary ataxias are usually caused by degeneration of the spinal cord, cerebellum, or other parts of the nervous system. The most common is Friedreich ataxia, which begins at ages 3-5, progressing slowly to almost complete incapacity by age 20. There is no specific therapy. Metabolic disorders, brain injuries, and toxins can cause ataxia.

Atbara \'at-ba-ra\ River River, North Africa. Rising in the Ethiopian highlands, it flows about 500 mi (800 km) northwest through eastern Sudan to join the Nile River at Atbara in The Sudan. It is the Nile's northernmost tributary.

Atchafalaya Na-.cha-fs-'lI-sX Bay Inlet of the Gulf of Mexico on the Louisiana coast, U.S. Together with Four League Bay, it extends about 21 mi (34 km). The Atchafalaya River links the bay with Morgan City on the Gulf Intracoastal Waterway. The area includes many natural gas and oil fields.

Atchafalaya River River, southern Louisiana, U.S. A distributary of the Red and Mississippi rivers, it branches southwest from the Red River in east-central Louisiana and flows south about 140 mi (225 km) to Atchafalaya Bay. Its name is Choctaw for "Long River."

Atchison, Topeka and Santa Fe Railroad Co. Former railway. Chartered in Kansas in 1860 by Cyrus K. Holliday, the founder of Topeka, as the Atchison and Topeka Railroad Co., it was built along the Santa Fe Trail and became known as the Santa Fe Railway. Its main line, completed in 1872, extended to the Colorado state border. Further expansion west in the 1880s and early 1890s reached about 9,000 mi (14,500 km) of track. It reached its greatest extent in 1941, with more than 13,000 mi (21,000 km) of track, but gradually shrank thereafter. In 1971 its famously luxurious passenger service was sold to Amtrak. In the 1990s it merged with Burlington Northern to become Burlington Northern Santa Fe Railway.

atelectasis X.at-T-'ek-ts-sssV or lung collapse Lack of expansion of pulmonary alveoli (see pulmonary alveolus). With a large-enough collapsed area, the victim stops breathing. In adhesive atelectasis, obstruction or lack of surface tension keeps a newborn's alveoli from expanding. Compression atelectasis is caused by external pressure. Obstructive atelectasis may be caused by blockage of a major airway or when pain from abdominal surgery keeps breathing too shallow to clear bronchial secretions; treatment involves removal of obstruction or fluids, control of infection, and lung reinflation.

Aten See Aton

Atget \at-'zhe\, (Jean-) Eugene (-Auguste) (b. Feb. 12, 1857, Liboume, near Bordeaux, France — d. Aug. 4, 1927, Paris) French pho-

Atalanta, Greek marble statue; in the Louvre.

GIRAUDON-ART RESOURCE

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tographer. He began his adult life as an itinerant actor. Around age 30 he settled in Paris and became a photographer. The rest of Atget's life was spent recording everything he could that he considered picturesque or artistic in and around Paris. With an eye for strange and unsettling images, he made several series of photographs of iron grillwork, fountains, statues, and trees. He also photographed shop fronts, store windows, and poor tradespeople. His main clients were museums and historical societies that bought his photographs of historic buildings and monuments. After World War I he received a commission to document the brothels of Paris. Man Ray published four of Atget's photographs in La revolution surrealiste (1926), the only recognition he received in his lifetime. After his death, Ray, Berenice Abbott, and the art dealer Julien Levy bought his remaining collection, which is now in the Museum of Modem Art.

Athabasca, Lake Lake, western central Canada. It extends 208 mi (335 km), crossing the Alberta-Saskatchewan boundary. On the southwest it receives the Athabasca River, and on the northwest it discharges into the Slave River. It is important for its commercial fishing.

Athabasca River River, west-central Canada. A tributary of the Mackenzie River in Alberta, it rises in the Rocky Mountains in Jasper National Park and flows northeast and north 765 mi (1,231 km) into Lake Athabasca. Its chief tributaries are the Pembina, Lesser Slave, McLeod, and Clearwater rivers. Extensive petroleum deposits lie in oil-impregnated sands (Athabasca Tar Sands) along a 70-mi (113-km) stretch of the river.

Athabaskan languages or Athapaskan languages Family of North American Indian languages. There are perhaps 200,000 speakers of Athabaskan. Northern Athabaskan includes more than 20 languages scattered across an immense region of subarctic North America from western Alaska to Hudson Bay and south to southern Alberta and British Columbia. Pacific Coast Athabaskan consisted of four to eight languages, all now extinct or nearing extinction. Apachean consists of eight closely related languages spoken in the southwestern U.S. and northern Mexico, including Navajo and the various subdivisions of Apache. In 1990 Navajo had some 150,000 speakers, far more than any other indigenous language of the U.S. or Canada. In 1915 Edward Sapir placed the Athabaskan family together with Tlingit and Haida (languages of Alaska and British Columbia, respectively) in a larger grouping called Na-Dene; this hypothetical relationship continues to be controversial.

Athanasius V.a-tho-'na-zhosV Saint (b. 293, Alexandria, Egypt — d. May 2, 373, Alexandria; feast day May 2) Early Christian theologian and staunch opponent of Arianism. He studied philosophy and theology at Alexandria, Egypt, and in 325 he attended the Council of Nicaea, which condemned the Arian heresy. He welcomed the council's teaching that

the Son is “consubstantial with the Father” and defended that teaching throughout his career. In 328 he was appointed patriarch of Alexandria, but theological disputes led to the first of several banishments in 336. He returned from exile repeatedly and resumed his office, but Arian opposition continued. After being banished by Constantius II in 356, Athanasius lived in a remote desert in Upper Egypt and wrote theological treatises, including his Four Orations Against the Arians. The emperor’s death in 361 gave Athanasius a brief respite under the toleration proclaimed by Julian, but a controversy with Julian’s heathen subjects forced him to flee into the Theban desert. At the time of his death he again possessed the see at Alexandria.

atheism Va-the-.iz-omN Critique and denial of metaphysical beliefs in God or divine beings. Unlike agnosticism, which leaves open the question of whether there is a God, atheism is a positive denial. It is rooted in an array of philosophical systems. Ancient Greek philosophers such as Democritus and Epicurus argued for it in the context of materialism. In the 18th century David Hume and Immanuel Kant, though not atheists, argued against traditional proofs for God’s existence, making belief a matter of faith alone. Atheists such as Ludwig Feuerbach held that God was a projection of human ideals and that recognizing this fiction made self-realization possible. Marxism exemplified modem materialism. Beginning with Friedrich Nietzsche, existentialist atheism proclaimed the death of God and the human freedom to determine value and meaning. Logical positivism holds that propositions concerning the existence or nonexistence of God are nonsensical or meaningless.

Athena \3-'the-n3\ or Athene \9-'the-ne\ In ancient Greek religion, the goddess of war, handicraft, and wisdom and the patroness of Athens. Her Roman counterpart was Minerva. Hesiod told how Athena sprang in full armour from Zeus’s forehead. In the Iliad she fought alongside the Greek heroes, and she represented the virtues of justice and skill in warfare as opposed to the blood lust of Ares. She was associated with birds (especially the owl) and the snake, and she was usually represented as a virgin goddess. Her birth and contest with Poseidon for suzerainty of Athens were depicted on the Parthenon. Her birthday festival was the Panathenaea.

Athens Greek Athinai \a-'the-ne\

City (pop., 2001: 745,514), capital of Greece. It is located inland near its port, Piraeus, on the Saronic Gulf in eastern Greece. The source of many of the West’s intellectual and artistic conceptions, including that of democracy, Athens is generally considered the birthplace of Western civilization. An ancient city-state, it had by the 6th century bc begun to assert its influence. It was destroyed by Xerxes in 480 bc, but rebuilding

began immediately. By 450 bc, led by Pericles, it was at the height of its commercial prosperity and cultural and political dominance, and over the next 40 years many major building projects, including the Acropolis and Parthenon, were completed.

Athens’s “Golden Age” saw the works of the philosophers Socrates,

Plato, and Aristotle; the dramatists Sophocles, Aristophanes, and Euripides; the historians Herodotus, Thucydides, and Xenophon; and the sculptors Praxiteles and Phidias. The Peloponnesian Wars with Sparta ended in Athens’s defeat in 404, but it quickly recovered its independence and prosperity. After 338 bc Athens came under Macedonia’s hegemony, which was lifted with the aid of Rome in 197 bc in a battle at Cynoscephalae. It became subject to Rome in 146 bc. In the 13th century Athens was taken by the Crusaders. It was conquered in 1456 by the Ottoman Turks, who held it until 1833, when it was declared the capital of independent Greece. Athens is Greece’s principal centre for business and foreign trade. The city’s ruins and many museums make it a major tourist destination. It was selected to host the 2004 Olympic Games.

The Varvakeion, a Roman marble copy (c. ad 1 30) of the colossal gold and ivory statue of the Athena Parthenos by Phidias (438 bc); in the National Archaeological Museum, Athens.

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atherosclerosis or hardening of the arteries Chronic disease characterized by abnormal thickening of the walls of the arteries due to fatty deposits (atheromas) of cholesterol on the arterial inner walls (see artery). These thicken, forming plaques that narrow the vessel channel (lumen) and impede blood flow. Scarring and calcification make the walls less elastic, raising blood pressure. Eventually plaques may completely block a lumen, or a blood clot (thrombus) may obstruct a narrowed channel. Atherosclerosis of one or more coronary arteries (also called coronary heart disease) can decrease the heart muscle’s blood supply, causing angina pectoris. Complete blockage causes heart attack. In the brain, atherosclerosis may result in stroke. Treatments include drugs that reduce the level of cholesterol and fat in the blood, anticoagulants and other drugs that prevent the formation of blood clots, coronary bypass, and balloon ANGIOPLASTY.

athlete's foot Form of ringworm that affects the feet. In the inflammatory type, the infection may lie inactive much of the time, with occasional acute episodes in which blisters develop, mostly between the toes. The dry type is a chronic condition marked by slight redness of the skin and dry scaling that may involve the sole and sides of the foot and the

toenails, which become thick and brittle.

athletics See track and field

Athos Va- ,thos\. Mount Mountain, northern Greece. Reaching a height of 6,670 ft (2,033 m), it occupies Aktf, a promontory of the Chalcidice Peninsula. It is the site of a semiautonomous republic of 20 monasteries and dependencies (skftes). Organized monastic life began there in 963, when St. Athanasius the Athonite founded the first monastery. By 1400

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there were 40 monasteries. Long regarded as the holy mountain of the Greek Orthodox Church, it was declared a theocratic republic in 1927. Its churches and libraries house a rich collection of Byzantine art and ancient and medieval manuscripts.

Athyr See Hathor

Atitlan V.a-te-'tlanV, Lake Lake, southwestern Guatemala. It lies at an elevation of about 5,100 ft (1,560 m) in the central highlands. Occupying a crater some 1,000 ft (300 m) deep, the lake is 12 mi (19 km) long and 6 mi (10 km) wide. On its borders are three volcanoes: Atitlan, Toliman, and San Pedro. Many of the towns along the lake, including Atitlan and San Lucas, are popular tourist destinations.

Atkins, Chet orig. Chester Burton Atkins (b. June 20, 1924, Luttrell, Tenn., U.S. — d. June 30, 2001, Nashville, Tenn.) U.S. guitarist and record company executive. Atkins began his musical career as a fiddler in the early 1940s, but it was his signature style of playing guitar (bass rhythm played with thumb, melody picked with three fingers) that brought him worldwide acclaim. In the early 1950s he began playing electric guitar, pioneering its use in country music. As an RCA Records executive, he produced hit recordings for Elvis Presley, Jim Reeves, and Waylon Jennings.

Atlanta City (pop., 2000: 416,474; metro, area pop.: 4,112,198), capital of Georgia, U.S. Lying in the foothills of the Blue Ridge Mountains, Atlanta is Georgia’s largest city. In 1837 a spot was selected there for a railroad terminus that would serve the southeastern U.S. First named Terminus and later Marthas ville, it was given the name Atlanta in 1845. An important supply depot during the American Civil War, it was burned by Union forces under William T. Sherman. Atlanta became the state capital in 1868. As it recovered from the war’s destruction, it began to epitomize the spirit of the “New South” in seeking reconciliation with the North. It was the home of Martin Luther King, Jr., and the first major Southern city to elect a black mayor (1970). It is the principal trade and transportation centre of the southeastern U.S.

Atlanta Campaign Important series of battles in the American Civil War in Georgia (May-September 1 864). Though most of the battles ended

in draws, they eventually cut off the main Confederate supply centre, Atlanta. Union troops under William T. Sherman forced the evacuation of the city (August 31-September 1) and then burned it. His victory assured the reelection of Pres. Abraham Lincoln later that year.

Atlanta Compromise Classic statement on race relations by Booker T. Washington, made in a speech at the Atlanta Exposition (1895). He asserted that vocational education, which gave blacks a chance for economic security, was more valuable than social equality or political office. Many African Americans feared that such a limited goal would doom them to indefinite subservience to whites; that fear led to the Niagara Movement and later to the founding of the NAACP.

Atlanta Journal-Constitution Daily morning newspaper published in Atlanta, Ga., based largely on the former Atlanta Constitution. Generally regarded as the “voice of the New South,” the Constitution counted among the great newspapers of the U.S. It became a leader among Southern papers soon after its founding in 1868, and a succession of outstanding editors contributed to its distinction: Henry W. Grady (1850-89), in the late 1870s and 1880s; Clark Howell (1897-1938); and Ralph McGill, who served as both editor (1942-60) and publisher (1960-69). In 1950 it was bought by James M. Cox, who already owned the evening Atlanta Journal (founded 1883); for many years a merged paper, the Atlanta Journal-Constitution, was published on weekends until the two papers were fully merged in 2001.

Atlantic Charter Joint declaration issued on Aug. 14, 1941, during World War II, by Winston Churchill and Franklin D. Roosevelt. Among the statements made in this propaganda manifesto, signed when the U.S. had not yet entered the war, were that neither the U.S. nor Britain sought aggrandizement and that both advocated the restoration of self-government to peoples forcibly deprived of it. The charter was incorporated by reference in the Declaration of the UN (1942).

Atlantic City City (pop., 2000: 40,517) and resort, southeastern New Jersey, U.S. Lying on narrow Absecon Island, the resort began to be developed in the mid- 19th century. Amusement piers were constructed, and the first beachfront boardwalk was built there in 1870. The Miss America Pageant was established in Atlantic City in 1921. After World War II the city began to decline. In 1976 the state approved legalized gambling, and extensive development in Atlantic City provided a huge influx of money to the resort, but much of the surrounding area remained impoverished.

Atlantic Intracoastal Waterway Navigable route, coastal eastern U.S. Authorized by Congress in 1919 to provide sheltered passage for both commercial shipping and pleasure craft, and constructed by the Army Corps of Engineers, it was originally planned to form a continuous channel from New York City to Brownsville, Texas. Because the link through Florida was never completed, it remains in two separate sections (see Gulf Intracoastal Waterway). The Atlantic portion consists of rivers, bays, and canals from Cape Cod to Florida Bay, including the Cape Cod Canal and the Chesapeake and Delaware Canal.

Atlantic languages formerly West Atlantic languages Branch of the Niger-Congo language family. Atlantic comprises some 45 lan-

guages spoken by some 30 million people living mainly in Senegal, The Gambia, Guinea, Guinea-Bissau, Sierra Leone, and Liberia. About half of these people speak Fula, the language of the Fulani. The languages of the Wolof of Senegal and The Gambia and the Temne of northwest Sierra Leone are spoken by more than 1 million people.

Atlantic Monthly, The Monthly journal of literature and opinion, one of the oldest and most respected of U.S. reviews. Published in Boston, it was founded in 1857 by Moses Dresser Phillips. It soon became noted for the quality of its fiction and general articles, contributed by distinguished editors and authors such as James Russell Lowell, Ralph Waldo Emerson, Henry W. Longfellow, and Oliver Wendell Holmes. In the early 1920s it expanded its scope to political affairs, featuring articles by figures such as Theodore Roosevelt, Woodrow Wilson, and Booker T. Washington. In the 1970s increasing costs nearly shut down the magazine; it was purchased in 1980 by Mortimer B. Zuckerman and was sold to the National Journal Group in 1999.

Atlantic Ocean Ocean separating North and South America from Europe and Africa. The second largest of the world’s oceans, the Atlantic has an area of 31,830,000 sq mi (82,440,000 sq km). With its marginal seas, including the Baltic, North, Black, and Mediterranean to the east, and Baffin Bay, Hudson Bay, the Gulf of St. Lawrence, Gulf of Mexico, and Caribbean Sea to the west, it covers some 41,100,000 sq mi (106,450,000 sq km). Including these latter bodies of water, its average depth is 10,925 ft (3,330 m); its maximum depth is 27,493 feet (8,380 m) in the Puerto Rico Trench. Its most powerful current is the Gulf Stream.

Atlantic salmon Oceanic trout species (Salmo salar), a highly prized game fish. It averages about 12 lbs (5.5 kg) and is marked with round or cross-shaped spots. Found on both sides of the Atlantic Ocean, it enters streams in the fall to spawn. The young enter the sea in about two years and mature in about four. Adults may return to the sea and, after a year or two, spawn again. The ouananiche of rivers and the sebago, or lake, salmon are landlocked subspecies that are also prized for sport. The Atlantic salmon has been successfully introduced into the U.S. Great Lakes.

Atlantic, Battle of the Contest in World War II between Britain (and later the U.S.) and Germany for the control of Atlantic sea routes. Initially the Anglo-French coalition drove German merchant shipping from the Atlantic, but with the fall of France in 1940, Britain was deprived of French naval support. The U.S. then assisted Britain with the lend-lease program. Early in 1942, the Axis began a large-scale submarine offensive against coastal shipping in U.S. waters, and German U-boats also operated in force along the South Atlantic ship lanes to India and the Middle East. Allied shipping losses were severe, but the Allies succeeded in tightening their blockade of Axis Europe and combating the Axis war on shipping. By mid- 1943 the Allies had recovered control of the sea routes.

Atlantis Legendary sunken island in the Atlantic Ocean west of Gibraltar. The main sources for the legend are two of Plato’s dialogues, Timaeus and Critias. According to Plato, Atlantis had a rich civilization, and its princes made many conquests in the Mediterranean before earthquakes destroyed the island and it was swallowed up by the sea. Plato also supplied a history of its ideal commonwealth, and Atlantis is sometimes imagined as a utopia. The legend may have originated with the eruption c. 1500 bc of a volcano on ThIra, which was so powerful that it gave rise to earthquakes and tidal waves.

atlas Collection of maps or charts, usually bound together. The name derives from a custom — initiated by Gerardus Mercator in the 16th century — of using the figure of the Titan Atlas, holding the globe on his

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shoulders, as a frontispiece for books of maps. Abraham Ortelius's Epitome of the Theater of the World (1570) is generally thought to be the first modern atlas. Atlases often contain pictures, tabular data, facts about areas, and indexes of place-names keyed to coordinates of latitude and longitude or to a locational grid with numbers and letters along the sides of maps.

atlas Male figure used as a column to support an entablature, balcony, or other projection, originating in Classical architecture. Such figures are posed as if supporting great weights, like Atlas bearing the world. The related telamon of Roman architecture, the male counterpart of the caryatid, is also a weight-bearing figure but does not usually appeal' in an atlas pose.

Atlas In Greek mythology, the strong man who supported the weight of the heavens on his shoulders. He was the son of the Titan Iapetus and the nymph Clymene (or Asia) and the brother of Prometheus. According to Hesiod, Atlas was one of the Titans who waged war against Zeus, and as punishment he was condemned to hold aloft the heavens.

Atlas, Charles orig. Angelo Siciliano (b. Oct. 30, 1893, Acri, Italy— d. Dec. 24, 1972, Long Beach, N.Y., U.S.) Italian-born U.S. bodybuilder. Atlas immigrated to the U.S. at age 10. In 1929 he and the adver-tiser Charles P. Roman launched a course involving isotonic exercises and nutritional maintenance. Their mail-order bodybuilding course became legendary through advertisements in three generations of pulp comic books, the standard ad depicting scenes in which a skinny boy loses his girlfriend to a well-built lifeguard (who kicks sand in his face) and regains her after taking the Atlas course.

Atlas Mountains Mountain system, northwestern Africa. It extends some 1,200 mi (2,000 km) from the Moroccan port of Agadir in the southwest to the Tunisian capital of Tunis in the northeast. It comprises several ranges, rising to various elevations, including the High Atlas in Morocco; the Tell, or Maritime, Atlas, which runs along the coast from Morocco to Tunisia; and the Saharan Atlas in Algeria, located farther inland and running adjacent to the Sahara. Among these ranges are situated numerous plateaus and plains that support diverse ecologies. The system's highest peak is Morocco's Mount Toubkal, elevation 13,665 ft (4,165 m).

Atlas rocket Any of a series of U.S. expendable space launch vehicles. The Atlas was originally designed as a liquid-fueled ICBM and first tested

in an operational version in 1959. Early versions launched most of the Mercury manned missions and, coupled with upper-stage rockets, a number of Ranger, Surveyor, Mariner, and Pioneer probes on lunar and planetary missions. Later generations have become workhorses of the U.S. space program and carry a wide variety of scientific, military, and commercial spacecraft.

atman Vat-msnV (Sanskrit: “breath” or “self’) Basic concept in Hindu philosophy, describing that eternal core of the personality that survives death and transmigrates to a new life or is released from the bonds of existence. Atman became a central philosophical concept in the Upanishads. It underlies all aspects of personality, as Brahman underlies the working of the universe. The schools of Samkhya, Yoga, and Vedanta are particularly concerned with atman. See also soul.

atmosphere Gaseous envelope that surrounds the Earth. Near the surface it has a well-defined chemical composition (see air). In addition to gases, the atmosphere contains solid and liquid particles in suspension. Scientists divide the atmosphere into five main layers: in ascending order, the troposphere (surface to 6-8 mi, or 10-13 km); the stratosphere (4-11 mi, or 6-17 km, to about 30 mi, or 50 km); the mesosphere (31-50 mi, or 50-80 km); the thermosphere (50-300 mi, or 80-480 km); and the exosphere (from 300 mi and gradually dissipating). Most of the atmosphere consists of neutral atoms and molecules, but in the ionosphere a significant fraction is electrically charged. The ionosphere begins near the top of the stratosphere but is most distinct in the thermosphere. See also ozone layer. See illustration opposite.

atmospheric pressure or barometric pressure Force per unit area exerted by the air above the surface of the Earth. Standard sea-level pressure, by definition, equals 1 atmosphere (atm), or 29.92 in. (760 mm) of mercury, 14.70 lbs per square in., or 101.35 kilopascals, but pressure varies with elevation and temperature. It is usually measured with a mercury barometer (hence the term barometric pressure), which indicates the height of a column of mercury that exactly balances the weight of the

column of atmosphere above it. It may also be measured using an aneroid barometer, in which the action of atmospheric pressure in bending a metallic surface is made to move a pointer.

atoll \'a- ,tol\ Coral reef enclosing a lagoon. Atolls consist of ribbons of reef that may not be circular but that are closed shapes, sometimes miles across, around a lagoon that may be 160 ft (50 m) deep or more. Most of the reef itself is usually below the water surface; around the rim along the top are usually low, flat islands or more continuous strips of low, flat land.

atom Smallest unit into which matter can be divided and still retain the characteristic properties of an element. The word derives from the Greek atomos (“indivisible”), and the atom was believed to be indivisible until the early 20th century, when electrons and the nucleus were discovered. It is now known that an atom has a positively charged nucleus that makes up more than 99.9% of the atom’s mass but only about 1/100,000 of its volume. The nucleus is composed of positively charged protons and electrically neutral neutrons, each about 2,000 times as massive as an electron. Most of the atom’s volume consists of a cloud of electrons that have very small mass and negative charge. The electron cloud is bound to the nucleus by the attraction of opposite charges. In a neutral atom, the pro-

tons in the nucleus are balanced by the electrons. An atom that has gained or lost electrons becomes negatively or positively charged and is called an ion. See illustration on opposite page.

atomic bomb Weapon whose great explosive power results from the sudden release of energy upon the splitting, or fission, of the nuclei of heavy elements such as plutonium or uranium (see nuclear fission). With

(°C)

-100 -80 -60 -40 -20 0 20

pressure (atm)

In Earth's atmosphere, the limits of the atmospheric layers are approximate and variable, especially with latitude. Most weather occurs within the troposphere. The ozone layer, which absorbs most incoming ultraviolet radiation, forms part of the stratosphere. The thermosphere extends hundreds of miles above Earth's surface and is bounded by outer space. Atmospheric pressure drops off steadily with altitude, but temperature rises and falls through successive layers in a more complex manner.

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atomic number ► atonement I 1 27

nucleus —

neutron

-S

J proton

e electron

The classical "planetary" model of an atom. The protons and neutrons in the nucleus are circled by electrons in "orbit" around the nucleus. The number of protons determines which element is represented, the number of electrons determines its charge, and the number of neutrons determines which isotope of the element is represented.

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only 11-33 lb (5-15 kg) of highly enriched uranium, a modern atomic bomb could generate a 15-kiloton explosion, creating a huge fireball, a large shock wave, and lethal radioactive fallout. The first atomic bomb, developed by the Manhattan Project during World War II, was set off on July 16, 1945, in the New Mexico desert. The only atomic bombs used in war were dropped by the U.S. on Hiroshima on Aug. 6, 1945, and on Nagasaki three days later. In 1 949 the Soviet Union tested its first atomic bomb, followed by Britain (1952),

France (1960), China (1964), India (1974), and Pakistan (1998). Israel and South Africa were suspected of testing atomic weapons in 1979. See also HYDROGEN BOMB; NUCLEAR NON-PROLIFERATION Treaty; nuclear weapon.

atomic number Number of a chemical element in the systematic, ordered sequence shown in the periodic table. The elements are arranged in order of increasing number of protons in the nucleus of the atom (the same as the number of electrons in the neutral atom), and that number for each element is its atomic number.

atomic physics Scientific study of the structure of the atom, its energy states, and its interaction with other particles and fields. The modem understanding of the atom is that it consists of a heavy nucleus of positive charge surrounded by a cloud of light, negatively charged electrons. The physical properties of atoms are largely determined by the laws of quantum mechanics and quantum electrodynamics. The primary tools for the study of these properties are spectroscopy, particle collisions (see particle accelerator), and statistical models that simulate complex, many-body interactions (such as gas dynamics). A broad field, atomic physics has applications in the study of condensed matter, gases, chemical-reaction

First atomic bomb test, near Alamogordo, New Mexico, July 1 6, 1 945.

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mechanisms, atmospheric science, lasers, nuclear physics, and the arrangement of elements in the periodic table.

atomic weapon See nuclear weapon

atomic weight Ratio of the average mass of a chemical element’s atoms to Vn the mass of an atom of the carbon- 12 isotope. The original standard

of atomic weight, established in the 19th century, was hydrogen, with a value of 1. From c. 1900 until 1961, the reference standard was oxygen, with a value of 16, and the unit of atomic mass was defined as Vie the mass of an oxygen atom. Oxygen, however, contains small amounts of two isotopes that are heavier than the most abundant one, and 16 is actually a weighted average of the masses of the three isotopes of oxygen. Therefore, the standard was changed to one based on carbon- 12. The new scale required only minimal changes to the values that had been used for chemical atomic weights.

atomism Philosophical doctrine that material objects are aggregates of simpler parts known as atoms. Atomism in the strict sense is characterized by three points: the atoms are absolutely indivisible, qualitatively identical apart from shape, size, and motion, and combinable with each other only by juxtaposition. Atomism is usually associated with realism and mechanism; it is mechanistic because it maintains that all observable changes can be reduced to changes in the configuration of the atoms that constitute matter. It is opposed to holism because it holds that the properties of any whole can be explained in terms of those of its parts.

Aton or Aten Va-ton, 'a-ton\ In ancient Egyptian religion, a sun god, depicted as the solar disk emitting rays terminating in human hands. The pharaoh Akhenaton (r. 1353-36 bc) declared Aton to be the only god, and in opposition to the Amon-Re priesthood of Thebes, built the city of Akhetaton as the center for Aton’ s worship, but Aton’s religion is poorly understood. After Akhenaton’ s death, the old religion was restored.

under the rays of the sun god Aton, altar relief, mid- 1 4th century bc; in the State Museums at Berlin

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atonality \ 1 a-to-'na-lo-te\ In music, the absence of functional harmony as a primary structural element. Probably originally a pejorative term applied to music of extreme chromaticism, it has become the most widely used descriptive term for 20th-century music whose connection with tonality is difficult to hear. Arnold Schoenberg and his students Alban Berg and Anton Webern are regarded as the seminal atonal composers; the serialism of their later work is often distinguished from their earlier “free atonality.”

atonement Religious concept in which obstacles to reconciliation with God are removed, usually through sacrifice. Most religions have rituals of purification and expiation by which the relation of the individual to the divine is strengthened. In Christianity, atonement is achieved through the death and resurrection of Jesus. In Roman Catholicism, Eastern Orthodoxy, and some Protestant churches, penance is a sacrament that allows for per-

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sonal atonement (see confession). In Judaism the annual Day of Atonement, Yom Kippur, is the culmination of 10 days centered on repentance.

Atonement, Day of See Yom Kippur

ATP in full adenosine triphosphate Xs-'de-ns-.sen-tri-'fas-.faA Organic compound, substrate in many enzyme-catalyzed reactions (see catalysis) in the cells of animals, plants, and microorganisms. ATP's chemical bonds (see bonding) store a large amount of chemical energy. ATP therefore functions as the carrier of chemical energy from energy-yielding oxidation (see oxidation-reduction) of food to energy-demanding cellular processes. Three such processes of metabolism are sources of ATP and stored energy: fermentation, the tricarboxylic acid cycle, and cellular respiration (also called oxidative phosphorylation). All form ATP from adenosine monophosphate (AMP) or adenosine diphosphate (ADP) and inorganic phosphate. When the reaction goes in the other direction, ATP is broken down to ADP or AMP and phosphate, and the released energy is used to perform chemical, electrical, or osmotic work for the cell.

atresia and stenosis \3- , tre-zh3...ste-'no-s3s\ Absence (atresia), usually congenital, or narrowing (stenosis) of almost any normal body cavity or passage. The more important include atresia of the anus, esophagus, aortic arch, heart valves, and urinary passages; and stenosis of the intestine, urinary passages, pyloric valve (stomach outlet), and heart valves. Most must be surgically corrected soon after birth.

Atreus \'a-tre-os\ In Greek legend, the son of Pelops. Atreus became king of Mycenae and drove out his brother Thyestes. Plagued by a curse on the house of Pelops, Atreus murdered his own son Pleisthenes and was eventually killed by the nephew he had raised as a son. Two more sons, Agamemnon and Menelaus, fought in the Trojan War.

atrial Va-tre-oP fibrillation Irregular rhythm (arrhythmia) of contraction of the atria (upper heart chambers). The most common major arrhythmia, it may result as a consequence of increased fibrous tissue in the aging heart, of heart disease, or in association with severe infection. If it continues, it can permit formation of blood clots, which can block blood flow to essential organs. Emergency treatment consists of drugs such as beta-blockers or digitalis, which slow the heart's action, and anticoagulants. In addition, atrial fibrillation can be interrupted by administering electric shocks (defibrillation). See also ventricular fibrillation.

atrium Va-tre-onP In an ancient Roman house, an open central court that contained the impluvium, a basin where rainwater collected. It originally contained the health and functioned as the center of family life. The term later came to be used for the open front courtyard of a Christian basilica, where congregants collected before services. The atrium was revived in the 20th century in the form of glass-covered, greenery-filled multistory spaces sometimes found in shopping centers, office

buildings, and large hotels.

atrophy Va-tr9-fe\ Decrease from previous normal size of the body or a part, cell, organ, or tissue. An organ or body part' s cells may be reduced in number, size or both. Atrophy of some cells and organs is normal at certain points in the life cycle. Other causes include malnutrition, disease, disuse, injury, and hormone over- or underproduction.

atropine Va-tra-.penX Anticholinergic drug. A poisonous, crystalline alkaloid derived from certain nightshade plants, especially Egyptian henbane, atropine is used chiefly to dry up bodily secretions, to dilate the bronchi, to prevent excessive cardiac slowing during anesthesia, and in ophthalmology to dilate the pupil of the eye. It works by suppressing the parasympathetic nervous system. Atropine is also used as an antidote for nerve gas poisoning.

Atsumi Kiyoshi (b. March 10, 1928, Tokyo, Japan — d. Aug. 4, 1996, Tokyo) Japanese comic actor. Atsumi grew up in an impoverished section of Tokyo and took odd jobs in the theatre before first portraying the role of Tora-san for a television film in 1968. He went on to play the character until 1996 in the 48-film series Otoko wa tsurai yo ("It's Tough Being a Man"), the longest-running series in which the same actor portrayed the central character. Tora-san, a middle-aged peddler, is a charmingly irresponsible rogue who sells trinkets to passersby and unsuccessfully courts pretty women. Atsumi infused the role with witty wordplay and a folksy sincerity.

attainder In English law, the extinction of civil and political rights after a sentence of death or outlawry, usually after a conviction of treason. A legislative act attainting a person without trial was known as a bill of attainder. The most important consequences of attainder were forfeiture of property and "corruption of blood," meaning that the attainted person was disqualified from inheriting or transmitting property, thus disinheriting his descendants. All forms of attainder except forfeiture following indictment for treason were abolished in the 19th century. As a result of the English experience, the U.S. Constitution provided that "no Attainder of Treason shall work Corruption of Blood, or Forfeiture except during the Life of the Person attainted." The U.S. Supreme Court has also struck down as bills of attainder such things as the test oaths passed after the Civil War to disqualify Confederate sympathizers from certain professions.

Attalus I Soter \ , at-3-tas... , s6t-3r\ (b. 269 — d. 197 bc) Ruler of Pergamum (241-197). He crushed an attack by the Galatians (c. 230) and won most of Anatolia (228) through victory over the Seleucid king, though by 222 the Seleucids had won most of it back. With Rome Attalus fought the First and Second Macedonian Wars, but he died shortly before Philip V's defeat. He was celebrated as a patron of the arts.

Attenborough, Sir David (Frederick) (b. May 8, 1926, London, Eng.) British television writer. For the BBC, which he joined in 1952, he originated the series Zoo Quest (1954-64). As controller of BBC-2 (1965—68) and director of programs (1968-72), he helped produce The Forsyte Saga , The Ascent of Man, and Civilisation. As an independent producer,

he made innovative educational programs such as Life on Earth (1979) and The Living Planet (1984). He was knighted in 1985.

attention In psychology, the act or state of applying the mind to an object of sense or thought. Wilhelm Wundt was perhaps the first psychologist to study attention, distinguishing between broad and restricted fields of awareness. He was followed by William James, who emphasized active selection of stimuli, and Ivan Pavlov, who noted the role attention plays in activating conditioned reflexes. John B. Watson sought to define attention not as an “inner” process but rather as a behavioral response to specific stimuli. Psychologists today consider attention against a background of “orienting reflexes” or “preattentive processes,” whose physical correlates include changes in the voltage potential of the cerebral cortex and in the electrical activity of the skin, increased cerebral blood flow, pupil dilation, and muscular tightening. See also attention deficit disorder.

attention deficit (hyperactivity) disorder (ADD or ADHD) formerly hyperactivity Behavioral syndrome in children, whose major symptoms are inattention and distrac Ability, restlessness, inability to sit still, and difficulty concentrating on one thing for any period of time. It occurs in about 5% of all schoolchildren, and it is three times more common in boys than in girls. It can adversely affect learning, though many children with ADD can learn to control their behaviour sufficiently to perform satisfactorily in school. It appears to be caused by a combination of genetic and environmental factors. Certain aspects of the syndrome may persist into adulthood. Treatment usually entails counseling and close parental supervision, and it may also include prescription medication.

atthakatha \,a-t3-'ka-t3\ Commentaries on the Pali Buddhist canon from ancient India and Ceylon. Pali commentaries had reached Ceylon by the 3rd century bc and been translated into Sinhalese by the 1st century ad. The scholar Buddhaghosa (5th century) reworked in Pali much of the early material plus Dravidian commentaries and Sinhalese traditions. The earlier atthakatha have disappeared, but the works of Buddhaghosa and his successors provide information on the development of life and thought in the Theravada Buddhist community and contain much secular and legendary material as well.

attic Floor of a dwelling contained within the eaves of the roof structure. The word originally denoted any portion of a wall above the main cornice (see entablature). Used by the ancient Romans principally for decorative purposes and inscriptions, as in triumphal arches, it became an important part of the Renaissance facade, often enclosing an additional story. See photograph on opposite page.

Atrium of the basilica of S. Ambrogio, Milan, 1 088-1 1 28

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Attica Greek Attiki \,a-te-'ke\
Ancient district, eastern central Greece. It was bordered by the Aegean Sea on the south and east and included the island of Salamis; its chief cities were Athens, Piraeus, and Eleusis. Its coastal settlements were enriched by maritime trade. Originally inhabited by Pelasgians, it was a center of Mycenaean culture in the 2nd millennium bc; the Ionian Greeks invaded it c. 1300 bc. The territory was unified under Athens by 700 bc, traditionally through the efforts of King Theseus.

Attila Va-Ul-o, a-'ti-b\ (d. 453)
King of the Huns (434-53, ruling jointly with his elder brother until c. 445). He was one of the greatest of the barbarian rulers who assailed the Roman Empire. He and his brother Bleda inherited an empire that stretched from the Alps and the Baltic nearly to the Caspian Sea. The failure of the Romans to pay promised tributes prompted Attila to launch assaults along the Danube in 441 and 443. He murdered his brother in 445 and two years later invaded the Balkan provinces and Greece, a campaign later ended by another peace treaty that exacted heavy damages from the Eastern Romans. He invaded Gaul (45 1) but was defeated by an alliance of the Roman general Aetius and the Visigoths. His invasion of Italy (452) was ended by famine and plague. His depredations, which seemed to some like divine punishment, earned him the epithet Flagellum Dei (“Scourge of God”). Attila died on his wedding night, possibly murdered by his bride. His sons took control of his empire, which collapsed shortly after Attila’ s death.

Attis Mythical consort of the Great Mother of the Gods and vegetation god worshiped in Phrygia and Asia Minor. His worship later spread to the Roman empire, where he became a solar deity in the 2nd century ad. The worship of Attis and the Great Mother included the celebration of mysteries at the beginning of spring.

attitude In psychology, a mental position with regard to a fact or state. Attitudes reflect a tendency to classify objects and events and to react to them with some consistency. Attitudes are not directly observable but rather are inferred from the objective, evaluative responses a person makes. Thus, investigators depend heavily on behavioral indicators of attitudes — what people say, how they respond to questionnaires, or such physiological signs as changes in heart rate. Attitude research is employed by social psychologists, advertising professionals, and political scientists, among others. Public-opinion researchers often attempt to distinguish attitudes from related concepts such as values, opinions, and knowledge.

Attlee, Clement (Richard), 1st Earl Attlee of Walthamstow

(b. Jan. 3, 1883, Putney, London,

Eng. — d. Oct. 8, 1967, Westminster,

London) British Labour Party leader (1935-55) and prime minister (1945—51). Committed to social reform, he lived for much of the years (1907-22) in a settlement house in London's impoverished East End. Elected to Parliament in 1922, he served in several Labour governments and in the wartime coalition government of Winston Churchill, whom he succeeded as prime minister in 1945. Attlee presided over the establishment of the welfare state in Britain, the nationalization of major British industries, and the granting of independence to India, an important step in the conversion of the British Empire into the Commonwealth of Nations. He resigned when the Conservatives narrowly won the election in 1951.

attorney See lawyer

attorney, power of Authorization to act as agent or attorney for another. Many of the general powers of attorney important in civil-law countries come under the powers of trust in common-law countries (see civil law, common law). Durable power of attorney becomes effective when the principal becomes unable to manage his or her affairs; general power of attorney authorizes the agent to carry on business for the principal; special power of attorney authorizes the agent to carry out a particular business transaction.

attorney general Chief law-enforcement officer of a state and legal adviser to the chief executive. The office dates to the Middle Ages but did not assume its modem form until the 16th century. In the U.S., the position dates to the Judiciary Act of 1789. Head of the Department of Justice and a member of the cabinet, the attorney general oversees all the government's law business and acts as the president's legal adviser. Every U.S. state also has an attorney general.

Attucks Vat-9ks\, Crispus (b. 1723? — d. March 5, 1770, Boston, Mass.) American patriot and martyr of the Boston Massacre. His early life is unclear, but he was probably a runaway slave of African and Natick Indian ancestry, and he may have served on whaling ships. He is the only one of the massacre's five victims who is widely remembered. In 1888 the Crispus Attucks monument was unveiled in the Boston Common.

Atwood, Margaret (Eleanor) (b. Nov. 18, 1939, Ottawa, Ont., Can.) Canadian poet, novelist, and critic. Atwood attended the University of Toronto and Harvard University. In the poetry collection The Circle Game (1964; Governor General's Award), she celebrates the natural world and condemns materialism. Her novels, several of which have become best-sellers, include Lady Oracle (1976), Bodily Harm (1981), The Handmaid's Tale (1985; Governor General's Award), The Robber Bride (1993),

Alias Grace (1996), and The Blind Assassin (2000). She is noted for her feminism and Canadian nationalism.

Aubusson \,o-b3-'so n \ carpet Floor covering produced at the village of Aubusson in central France. A centre for the production of tapestries and furniture coverings since the 16th century, Aubusson was granted the title of Royal Manufactory in 1665. In 1743 workshops were established to manufacture pile carpets for the nobility, and soon thereafter carpets were being produced in the flat-woven tapestry technique in floral and chinoiserie patterns. In the 19th-20th centuries the name Aubusson became synonymous with a flat-woven French carpet.

Auckland City (pop., 2001: 377,382; metro, area pop.: 1,158,891), North Island, New Zealand. Located on Waitemata and Manukau harbours, it is the country's principal port and largest city. Founded in 1840 as New Zealand's capital and named for George Eden, earl of Auckland, it remained the capital until superseded by Wellington in 1865. It is a major manufacturing and shipping centre. A bridge links it with the growing northern shore suburbs and with Devonport, New Zealand's chief naval base.

auction Buying and selling of property through open public bidding. Typically, potential purchasers make a succession of increasing bids or offers until the highest (and final) bid is accepted by the auctioneer. At a so-called Dutch auction, by contrast, the seller offers property at successively lower prices until one of his offers is accepted or until the price drops so low as to force the withdrawal of the offered property. Prospective buyers are usually allowed to examine auction items beforehand, and sellers may set a minimum price below which the property will not be sold. Auctions are important in the agricultural markets of many countries, permitting the rapid sale of perishable goods. Other items often sold at auction include artwork and antiques, secondhand goods, and farms and buildings repossessed by banks or the government. Auctions can be structured in many ways (e.g., bids submitted in person, via telephone, or over the Internet). Auction selling is also employed on stock and commodity exchanges.

Auden, W(ystan) H(ugh) (b. Feb. 21, 1907, York, Yorkshire, Eng. — d. Sept. 29, 1973, Vienna, Austria) British-born U.S. poet and man of letters. He attended Oxford University, where he exerted a strong influence on C. Day-Lewis, Louis MacNeice, and Stephen Spender. Auden's varied works throughout his life dealt with intellectual and moral issues of public concern as well as with the inner world of fantasy and dream. In the 1930s he became a hero of the left, pointing up the evils of capitalism while also warning against those of totalitarianism. He collaborated with Christopher Isherwood on three verse dramas. Auden's later writing

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reflects changes in his life (he became a U.S. citizen) and in his religious and intellectual perspective (he embraced Christianity and

■ became disillusioned with the left)

and occasionally his homosexuality.

His poetic works include The Age of Anxiety (1947, Pulitzer Prize) and the collections Another Time (1940) and Homage to Clio (1960). With his longtime companion Chester Kailman, he wrote opera librettos, notably The Rake's Progress (1951) for Igor Stravinsky.

audio card See sound card

Audion Elementary radio tube developed by Lee De Forest (patented 1907). It was the first triode vacuum tube, incorporating a control grid as well as a cathode and an anode. It was capable of more sensitive reception of wireless signals than were the electrolytic and Carborundum detectors then in use. The Audion made possible live radio broadcasting and became the key component of all radio, telephone, radar, television, and computer systems before the invention of the transistor.

audit Examination of the records and reports of an enterprise by accounting specialists other than those responsible for their preparation. Public auditing by independent accountants is common in large firms. The auditor performs tests to determine whether the firm's statements were prepared in accordance with acceptable accounting principles and that they fairly present its financial position and operating results. Personal tax audits are carried out to determine whether people have accurately reported their financial circumstances when filing their taxes. Failing such an audit may result in a fine, or, in cases of extensive and deliberate deception, criminal prosecution. See also Internal Revenue Service.

auditorium Portion of a theater or hall where an audience sits, as distinct from the stage. The auditorium originated in the theaters of ancient Greece, as a semicircular seating area cut into a hillside. Floor levels in a large auditorium may include stalls, private boxes, dress circle, balcony or upper circle, and gallery. A sloping floor and converging walls allow for a clear view of the stage and improve acoustics. The walls and ceilings of contemporary auditoriums usually conceal light, sound, and air-conditioning equipment.

Audubon, John James orig. Fouqere Rabin or Jean Rabin later Jean-Jacques Fougere Audubon (b. April 26, 1785, Les Cayes, Saint-Domingue, West Indies — d. Jan. 27, 1851, New York, N.Y., U.S.) U.S. ornithologist, artist, and naturalist known for his drawings and paintings of North American birds. Bom to a French merchant in Haiti, he returned with his father to France, where he briefly studied painting

with Jacques-Louis David before moving to the U.S. at age 18. From his father's Pennsylvania estate, he made the first American bird-banding experiments. After failing in business ventures, he concentrated on drawing and studying birds, which took him from Florida to Labrador. His extraordinary four-volume Birds of America was published in London in 1827-38. He simultaneously published the extensive accompanying text Ornithological Biography (5 vol., 1831-39). His multivolume Viviparous Quadrupeds of North America (1842-54) was completed by his sons. Though his bird poses are sometimes unrealistic (the result of painting dead birds wired into position) and some details are inaccurate, few argue with the excellence of his illustrations as art, and his studies were fundamental to New World ornithology.

Audubon Society, National U.S. organization dedicated to conserving and restoring natural ecosystems. Founded in 1905 and named for John James Audubon, the society has 600,000 members and maintains more than 100 wildlife sanctuaries and nature centres throughout the U.S. Its high-priority campaigns include preserving wetlands and endangered forests, protecting corridors for migratory birds, and conserving marine wildlife. Its 300-member staff includes scientists, educators, sanctuary managers, and government-affairs specialists.

Auerstedt, Battle of See Battles of Jena and Auerstedt

auger Tool (or bit) used with a carpenter's brace for drilling holes, usually in wood. It looks like a corkscrew and produces extremely clean holes, almost regardless of how large the bit is. Expansive auger bits have adjustable blades with cutting edges and spurs that can be extended radially to cut large holes. Large augers are used to bore holes in soil for fence posts and telephone poles, or in ice for ice fishing. Horizontal augers as much as 8 ft (2.5 m) in diameter are used in coal mining.

augite \'o-j!t\ Most common pyroxene mineral, occurring chiefly as blocky crystals in basalts, gabbros, andesites, and various other dark igneous rocks. It also is a common constituent of lunar basalts and meteorites and may be found in certain metamorphic rocks, such as pyroxenites. Because the diopside-hedenbergite series and augite are nearly indistinguishable, the term augite is sometimes used to designate any dark green to black pyroxene with monoclinic symmetry (three unequal crystallographic axes with one oblique intersection).

Augsburg \'auks-,burk\ City (pop., 2002 est.: 257,800), Bavaria, southern Germany. Founded as a Roman colony by Augustus c. 14 bc, it was the seat of a bishopric by ad 739. It became an imperial free city in 1276 and joined the Swabian League in 1331. The Fugger and Welser families made the city a major banking and commercial centre in the 15th- 16th centuries. The Augsburg Confession was read at the Diet of 1530; the Peace of Augsburg was concluded in 1555; and the League of Augsburg was formed in 1686. The city became part of Bavaria in 1806. It was heavily bombed during World War II. Sites of interest include the Fuggerei (1519), the world's oldest housing settlement for the poor.

Augsburg Vogz-borgX, League of Coalition formed in 1686 by Emperor Leopold I, the kings of Sweden and Spain, and the electors of Bavaria, Saxony, and the Palatinate. The league was formed to oppose the expansionist plans of Louis XIV of France prior to the War of the Grand Alliance. It proved ineffective because of the reluctance of some princes

to oppose France and the absence of provisions for combined military action.

Augsburg, Peace of Convention promulgated in 1555 by the Diet of the Holy Roman Empire, which provided the first permanent legal basis for the existence of Lutheranism in addition to Catholicism in Germany. The Diet determined that no member of the empire would make war against another on religious grounds. It recognized just two denominations, the Roman Catholics and the Lutherans, and it stipulated that in each territory of the empire, only one denomination was allowed. However, people were allowed to move to states where their faith was adopted. Despite numerous shortcomings, the accord saved the empire from serious internal conflicts for over 50 years. See also Reformation.

Augsburg Vauks-.biirkN Confession Basic doctrinal statement of Lutheranism. Its principal author was Philipp Melanchthon, and it was presented to Emperor Charles V at the Diet of Augsburg on June 25, 1530. Its purpose was to defend the Lutherans against misrepresentations of their teachings and to provide a statement of theology that Roman Catholics might accept. It consisted of 28 articles that outlined Lutheran doctrine and listed abuses that had crept into Western Christendom over the centuries. The unaltered document has remained authoritative for Lutherans, and a heavily revised version by Melanchthon is accepted by some Reformed churches. Translated into English in 1536, it had a major influence on the Anglican Church’s Thirty-nine Articles and the Methodists’ Twenty-five Articles of Religion.

Augusta City (pop., 2000: 18,560), capital of Maine, U.S. It was established in 1628 by traders from Plymouth colony as a post at the head of navigation on the Kennebec River. Fort Western was built there in 1754 (restored 1922), attracting settlers. Incorporated in 1797, the town was renamed the next year for the daughter of an American Revolutionary general. It became the state capital in 1832. It is one of Maine’s leading vacation centres.

Augustan Age (c. 43 bc-ad 18) Illustrious period in Latin literary history. Along with the preceding period, which was dominated by Cicero, it forms the Golden Age of Latin literature. Marked by civil peace and prosperity, the age reached its highest expression in poetry, with polished, sophisticated verse on themes of patriotism, love, and nature, generally addressed to a patron or to the emperor Augustus. Writers active in the period include Virgil, Horace, Livy, and Ovid. The term is also applied to “classical” periods in the literature of other nations, especially to late 17th- and 18th-century England.

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Augustine (of Hippo), Saint (b. Nov. 13, 354, Tagaste, Numidia — d. Aug. 28, 430, Hippo Regius; feast day August 28) Christian theologian and one of the Latin Fathers of the Church. Born in Roman North Africa,

he adopted Manichaeism, taught rhetoric in Carthage, and fathered a son. After moving to Milan he converted to Christianity under the influence of St. Ambrose, who baptized him in 387. He returned to Africa to pursue a contemplative life, and in 396 he became bishop of Hippo (now Annaba, Alg.), a post he held until his death while the city was under siege by a Vandal army. His best-known works include the Confessions, an autobiographical meditation on God's grace, and The City of God, on the nature of human society and the place of Christianity in history. His theological works On Christian Doctrine and On the Trinity are also widely read. His sermons and letters show the influence of Neoplatonism and carry on debates with the proponents of Manichaeism, Donatism, and Pelagianism. His views on predestination influenced later theologians, notably John Calvin. He was declared a Doctor of the Church in the early Middle Ages.

Augustine \o-'g9s-t9n\ of Canterbury, Saint (b. Rome? — d. May 26, 604/605, Canterbury, Kent, Eng.; feast day May 26 in England and Wales, May 28 elsewhere) First archbishop of Canterbury. A Benedictine prior in Rome, he was chosen by Pope Gregory I to lead 40 monks as missionaries to England. They arrived in 597 and were welcomed by King Ethelbert of Kent, at the behest of his queen, and he gave them a church in Canterbury. Augustine converted the king and thousands of his subjects and was made bishop of the English. On the pope's instructions he purified pagan temples and consecrated 12 other bishops. He founded Christ Church, Canterbury, as his cathedral and made Canterbury the primary see in England. He tried unsuccessfully to unify his churches with the Celtic churches of northern Wales.

Augustinian In the Roman Catholic church, a member of any of the religious orders and congregations whose constitutions are based on the Rule of St. Augustine, including the Hospitallers (Knights of Malta) and the Dominicans. The two main branches of the Augustinians, however, are the Augustinian Hermits and the Augustinian Canons. The former was one of the four great mendicant orders of the Middle Ages, and its members (including Martin Luther) were active in European university life and ecclesiastical affairs. The latter became in the 1 1th century the first Roman Catholic order to combine clerical status with full common life. The order declined after the Reformation, but it continues missionary, educational, and hospital work. Other notable orders are the Augustinian Recollects (founded in the 16th century) and the Second Order of St. Augustine (1264) for nuns, both still active today.

Augustus., Caesar or Octavian orig. Gaius Octavius later Gaius Julius Caesar Octavianus (b. Sept. 23, 63 bc — d. Aug. 19, ad 14, Nola, near Naples) First Roman emperor. Bom to a wealthy family, at age 18 he was named adoptive son and heir of his great-uncle Julius Caesar. After Caesar's assassination (44 bc) a power struggle ensued, and several battles later Octavian formed the Second Triumvirate with his chief rivals, Lepidus and Mark Antony. Octavian disposed of Lepidus in 32 and Antony (then allied with Cleopatra) at the Battle of Actium in 31 to become sole ruler. He was anointed princeps; the Roman Empire is said to begin with his accession. At first he ruled as consul, maintaining republican administration, but in 27 he accepted the title Augustus and in 23 he received imperial power. His rule (31 bc-ad 14) brought changes to every aspect of Roman life and lasting peace and prosperity to the Greco-Roman world. He secured outlying imperial provinces, built roads and public works, established the Pax Romana, and fostered the arts. He took steps to rectify Roman morality, even exiling his daughter Julia for adultery. When he died, the empire stretched from Iberia to Cappadocia and from

Gaul to Egypt. He was deified after his death.

Augustus II Polish August Fryderyk (b. May 12, 1670, Dresden, Saxony — d. Feb. 1, 1733, Warsaw) King of Poland and elector of Saxony (as Frederick Augustus I). He ascended to the Polish throne in 1697, having converted to Catholicism to better his chances. Also called Augustus the Strong, he invaded Livonia in 1700, beginning the Second Northern War. Charles XII of Sweden defeated Augustus's army and forced him to abdicate in 1706, but he was restored as king in 1710. Poland declined during Augustus's reign from a major European power to a protectorate of Russia.

Augustus III Polish August Fryderyk (b. Oct. 17, 1696, Dresden, Saxony — d. Oct. 5, 1763, Dresden) King of Poland and elector of Saxony (as Frederick Augustus II), whose reign (1733-63) marked a great

period of disorder within Poland. He cared more for pleasure than affairs of state and left the administration of Saxony and Poland to his chief adviser, Heinrich von Briihl (1700-1763), and the powerful Czartoryski family. He gave Saxon support to Austria in the War of the Austrian Succession and the Seven Years' War.

auk In general, any of 22 species of diving birds (family Alcidae), especially the little auk and the razorbill, or razor-billed auk. Auks are 6-16 in. (15—40 cm) long, with short wings and legs and webbed feet. They occur only in Arctic, subarctic, and temperate regions (with a few species south to Baja California). Auks nest colonially on cliff ledges or in rock crevices or burrows near the sea; many spend the winter far from land. They feed on fish, crustaceans, mollusks, and plankton. True auks are black and white and stand erect on land. See also great auk.

aulos Vo-los\ Single- or double-reed pipe usually played in pairs, particularly in ancient Greece. During the Classical period the pipes were of equal length, each with three or four finger holes. The principal wind instrument of most ancient Middle Eastern peoples, it existed in Europe up to the early Middle Ages, often as a single pipe with more finger holes.

Its quavering sound, described by Plato, was classically associated with the rites of Dionysus.

AUM Shinrikyo Vaum-shin-'rik-yo\ Japanese "AUM Supreme Truth" Japanese new religious movement founded by Asahara Shoko (b. 1955 as Matsumoto Chizuo) in 1987. It contained elements of Hinduism and Buddhism and was founded on the millenarian expectation of a series of disasters that would bring an end to this world and inaugurate a new cosmic cycle. In 1995 its members released nerve gas into the Tokyo subway system, killing 12 people and injuring some 5,500.

The group has been linked with other nerve-gas incidents and violent crimes. It claimed some 50,000 members, mostly in Russia, at the time of the gas attack. Membership collapsed in the wake of the attack, but it had grown to more than 1,500 members by the early 21st century. The group changed its name to Aleph in 2000. More than 10 AUM members were sentenced to death for their involvement in the gassing incident, including Asahara, who in 2004 was found guilty of masterminding the attack.

Aung San V6q-'san\ (b. 1914?, Natmauk, Burma — d. July 19, 1947, Rangoon) Nationalist leader of Burma (Myanmar). He led a student strike in 1936 and became secretary-general of a nationalist group in 1939. He accepted Japanese aid in raising a military force in Burma that helped the Japanese in their 1942 invasion. However, he came to doubt that the Japanese would ever allow Burma to become independent and grew displeased with their treatment of Burmese forces, and in 1945 he switched to the Allied cause. After the war, he effectively became prime minister and negotiated Burma's independence, which was agreed on in 1947; he was assassinated before independence was achieved in 1948.

Aung San Suu Kyi Vorj-'san-'sii-'cheX (b. June 19, 1945, Rangoon, Burma) Opposition leader in Burma (Myanmar). Daughter of nationalist leader Aung San, she studied in Burma and India and at the University of Oxford. She lived quietly in Britain until, returning to Myanmar in 1988, she was moved by the brutality of U Ne Win's military regime to begin a nonviolent struggle for democracy and human rights. The 1990 electoral victory of her National League for Democracy was ignored by Ne Win's government, and she was held under house arrest from 1989 to 1995. She subsequently continued her opposition activities and was subject to varying degrees of government harrassment, including another period of house arrest in 2000-02. She was awarded the 1991 Nobel Prize for Peace.

Aurangzeb V.aii-roq-'zebV orig. Muhi al-DTn Muhammad (b. Nov. 3, 1618, Dhod, Malwa, India — d. March 3, 1707) Last of the great Mughal emperors of India (r. 1658-1707). He was the third son of the emperor Shah Jahan and Mumtaz Mahal, for whom the Taj Mahal was built. After distin-

Auloi player with phorbeia and dancer with krotala, detail from a kylix found at Vulci, Italy, signed by Epictetus, c. 520-510 bc; in the British Museum, London.

COURTESY OF THE TRUSTEES OF THE BRITISH MUSEUM, LONDON

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guishing himself early in life with his military and administrative ability, he fought his eldest brother for the right of succession and had several other rival relatives (including a son) executed. During the first half of his reign, he proved to be a capable Muslim monarch of a mixed Hindu-Muslim empire; he was disliked for his ruthlessness but respected. From c. 1680 his devout religious side came to dominate; he excluded Hindus from public office and destroyed their temples and schools, became embroiled in fruitless warfare with the Marathas in South India, and executed the Sikh Guru Tegh Bahadur (r. 1664-75), starting a Sikh-Muslim feud that has continued to the present.

Aurelian \o-'ra-le-3n\ Latin Lucius Domitius Aurelianus

(b. c. 215 — d. 275, near Byzantium)

Roman emperor ad 270-75. Probably from the Balkans, he became emperor after Claudius II's death and the brief reign of Claudius's brother. He reunited the empire and restored Roman power in Europe, turning back invaders and quelling revolts, securing provinces in the east and defeating the Germans to the north, for which he took the title restitutor orbis ("restorer of the world"). He built a new wall around Rome and increased food distribution to the poor, but his monetary and religious reforms failed. While marching to Persia, he was slain by a group of officers who mistakenly believed they had been marked for execution.

Aurelius, Marcus See Marcus Aurelius

Aurgelmir Vaur-gsl-.mhA or Ymir Vi-mir\ In Norse mythology, the first being, a giant created from the drops of water that formed when the ice of Niflheim met the heat of Muspelheim. He was the father of all giants; a male and female grew under his arm and his legs produced a six-headed son, whom the cow Audumla nursed. Audumla licked salty frost from stones, which she shaped into the man Buri, grandfather of Odin and his brothers. The gods killed Aurgelmir and put his body into the void, where his flesh became the earth, his blood the seas, his bones mountains, his teeth stones, his skull the sky, and his brains the clouds. His eyelashes (or eyebrows) became the fence around Midgard, home of mankind.

Aurignacian culture \,6r-en-'ya-sh9n\ Stone-tool industry and artistic tradition of Upper Paleolithic Europe, named after the village of Aurignac in southern France where

the tradition was first identified. The Aurignacian period dates to 35, GOO-15, 000 bc. Its tools included scrapers, burins (which made the engraving possible), and blades.

Points and awls were fashioned from bones and antlers. Aurignacian art represents the first complete artistic tradition, moving from simple engravings of animal forms on small rocks to finer pieces of carved bone and ivory to highly stylized clay figurines of pregnant women (the so-called “Venus figures,” presumably fertility figures). By the end of the Aurignacian, hundreds of engravings, reliefs, and paintings had been executed on the walls and ceilings of limestone caves in western Europe, most famously Lascaux Grotto.

aurochs \'aur-,aks\ or auroch Extinct wild ox (Bos primigenius) of Europe, the species from which cattle are probably descended. The

aurochs survived in central Poland until 1627. It was black, stood 6 ft (1.8 m) high at the shoulder, and had spreading, forward-curving horns. Some German breeders claim to have re-created this race since 1945, but their animals are smaller and probably lack the aurochs’s genetic constitution. The name has sometimes been wrongly applied to the European bison.

Aurora Roman goddess of dawn. Her Greek counterpart was Eos. Hesiod described her as the daughter of the Titans Hyperion and Theia. She was the sister of Helios, the sun, and Selene, the moon. By the Titan Astraeus, she became the mother of the winds and of the evening star. In Greek mythology she was also represented as the lover of the hunters Cephalus and Orion.

aurora Luminous phenomenon of the upper atmosphere that occurs primarily at high latitudes. Auroras in the Northern Hemisphere are called aurora borealis, or northern lights; in the Southern Hemisphere they are called aurora australis, or southern lights. Auroras are caused by the interaction of energetic particles (electrons and protons) from outside the atmosphere with atoms of the upper atmosphere. Such interaction occurs in zones surrounding the Earth’s magnetic poles. During periods of intense solar activity, auroras occasionally extend to the middle latitudes.

Aurora City (pop., 2000: 276,393), north-central Colorado, U.S. It was founded near Denver as Fletcher during the silver boom of 1891 and renamed in 1907. Though mainly residential, it is also the site of Buckley Air National Guard Base.

Auschwitz \'aush-,vits\ or Auschwitz-Birkenau Nazi Germany’s largest concentration camp and extermination camp, located in southern Poland (modern Os wi^cim). It consisted of three camps (prison, extermination, and forced labour), established in 1940, 1941 (Birkenau), and 1942. Able-bodied Jewish prisoners were sent to a slave-labour camp, while the aged, the weak, and children and their mothers were killed. Some prisoners were also subjected to medical experiments, conducted by Josef Mengele. The camp was gradually abandoned in 1944^45 as

Soviet troops advanced. The total number who died at Auschwitz is estimated at between 1.1 million and 1.5 million, 90% of which were Jews; also among the dead were some 19,000 Roma (Gypsies), who were killed in July 1944, and some 83,000 Poles. Much of the camp was later converted into a museum and memorial. It was designated a UNESCO World Heritage site in 1979. See also Holocaust.

auscultation V.o-skol-'ta-shonV Procedure for detecting certain defects or conditions by listening for normal and abnormal heart, breath, bowel, fetal, and other sounds in the body. The invention of the stethoscope in 1819 improved and expanded this practice, still very useful despite the great technological advances in other means of diagnosis.

Ausgleich See Compromise of 1 867

Austen, Jane (b. Dec. 16, 1775, Steventon, Hampshire, Eng. — d. July 18, 1817, Winchester, Hampshire)

English novelist. The daughter of a rector, she lived in the circumscribed world of minor landed gentry and country clergy that she was to use in her writing; her closest companion was her sister, Cassandra. Her earliest known writings are mainly parodies, notably of sentimental fiction.

In her six full-length novels — Sense and Sensibility (1811), Pride and Prejudice (1813), Mansfield Park (1814), Emma (1815), Persuasion (1817), and Northanger Abbey (published 1817 but written before the others) — she created the comedy of manners of middle-class English life in her time. Her writing is noted for its wit, realism, shrewd sympathy, and brilliant prose style. Through her treatment of ordinary people in everyday life, she was the first to give the novel its distinctly modem character. She published her novels anonymously; two appeared only after her death, which probably resulted from Addison disease.

Aurangzeb, Mughal miniature, 17th century; in the Metropolitan Museum of Art, New York City

BY COURTESY OF THE METROPOLITAN MUSEUM OF ART, NEW YORK, BEQUEST OF GEORGE D. PRATT, 1 945

Cave painting of a bull and horse; in Lascaux Grotto, near Montignac,

France.

HANS HINZ, BASEL

c ..

Jane Austen, pencil and watercolour
by Cassandra Austen, c. 1810; in the
National Portrait Gallery, London.

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Austerlitz, Battle of (Dec. 2, 1805) First engagement of the War of the Third Coalition and one of Napoleon’s greatest victories. In the battle, fought near Austerlitz in Moravia (now Slavkov u Brna, Czech Rep.), Napoleon’s 68,000 troops defeated almost 90,000 Russians and Austrians under Russia’s Alexander I and Mikhail Kutuzov. Also called the Battle of the Three Emperors, Napoleon’s resounding victory forced Austria’s Francis I to conclude the Treaty of Pressburg, ceding Venetia to the French kingdom in Italy and temporarily ending the anti-French alliance. See also Napoleonic Wars.

Austin City (pop., 2000: 656,600), capital of Texas, U.S. It was founded in 1 835 as the village of Waterloo on the Colorado River in south-central Texas. In 1839 it was made capital of the Republic of Texas and renamed to honour Stephen Austin; when Texas became a state in 1845, Austin was its capital. As the home of the University of Texas, it has expanded as a research and development centre for defense, high-technology, and consumer industries. The Lyndon B. Johnson Library is on the university campus.

Austin, J(ohn) L(angshaw) (b. March 28, 191 1, Lancaster, Lancashire, Eng. — d. Feb. 8, 1960, Oxford) British philosopher. He taught at Oxford from 1945 until his death. He was a leading member of the “ordinary language,” or “Oxford,” movement of analytic philosophy, which was characterized by its belief that philosophical problems frequently arise through inattention to or misunderstandings of ordinary uses of language; accordingly, such problems can be resolved through consideration of the ordinary uses of the terms by which the relevant philosophical concepts are expressed. Ordinary-language analyses by Austin and his followers frequently took the form of asking “what one would say” in various concrete situations. Austin was also the inventor of speech act theory, through which he attempted to account for the various “performative” aspects of conveyed linguistic meaning. Several of his essays and lectures were published posthumously in Philosophical Papers (1961), Sense and Sensibilia (1962), and How to Do Things with Words (1962). See also analytic philosophy.

Austin, John (b. March 3, 1790, Creeting Mill, Suffolk, Eng. — d. Dec.

1859, Weybridge, Surrey) British jurist. Although initially unsuccessful in his law practice (1818-25), his analytical mind and intellectual honesty impressed colleagues, and he was named the first professor of jurisprudence at University College, London (1826). Distinguished men attended his lectures, but he failed to attract students, and he resigned his chair in 1832. His writings, especially The Province of Jurisprudence Determined (1832), sought to distinguish law from morality. He also helped to define jurisprudence as the analysis of fundamental legal concepts, as distinct from the criticism of legal institutions, which he called the “science of legislation.” His work, largely unrecognized in his lifetime, influenced later jurists, including Oliver Wendell Holmes, Jr.

Austin, Stephen (Fuller) (b. Nov. 3, 1793, Austinville, Va., U.S. — d. Dec. 27, 1836, Austin, Texas) U.S. founder of the first legal colony of English-speaking people in Texas when it was still part of Mexico. He was raised in the Missouri Territory and served in its legislature (181 4—19). The economic panic in 1819 led his father to conceive a plan to colonize Texas on land obtained from the Mexican government. Austin continued the project after his father died (1821) and founded a colony of several hundred families on the Brazos River in 1822. He maintained good relations with the Mexican government. He tried to induce the Mexican government to make Texas a separate state in the Mexican confederation; when this attempt failed, he recommended in 1833 the organization of a state without waiting for the consent of the Mexican congress, and he was imprisoned. Released in 1835, he traveled to the U.S. to secure help when the Texas revolution broke out in October of that year. He is considered one of the state’s founders. The city of Austin is named for him.

Austral Islands Group of islands (pop., 2002: 6,386), southern French Polynesia. The southernmost part of French Polynesia (austral is Latin for “south”), the islands form a chain about 800 mi (1,300 km) long. They were sighted by Capt. James Cook in 1769 and 1777. They were taken over by the French in the late 19th century. The inhabited islands are Rimatara, Rurutu, Tubuai, Raevavae, and Rapa.

Australia officially Commonwealth of Australia Smallest continent and sixth largest country (in area) on Earth, lying between the Pacific and Indian oceans. Area: 2,969,978 sq mi (7,692,208 sq km). Population (2005 est.): 20,345,000. Capital: Canberra. Most Australians are descendants of Europeans. The largest non white minority is the Aus-

tralian Aborigine population. The Asian portion of the population has grown as a result of relaxed immigration policy. Language: English (official). Religions: Christianity (mostly Protestant; also Roman Catholic, Eastern Orthodox, other Christians), Buddhism, Islam. Currency: Australian dollar. Australia has three major physiographic regions. More than half of its land area is on the Western Australian plateau, which includes the outcrops of Arnhem Land and the Kimberleys in the northwest and the Macdonnell Ranges in the east. A second region, the Interior Lowlands, lies east of the plateau. The Eastern Uplands, which include the Great Dividing Range, are a series of high ridges, plateaus, and basins. The country’s highest point is Mount Kosciusko in the Australian Alps, and the lowest is Lake Eyre. Major rivers include the Murray-Darling system, the Funders and Swan rivers, and Cooper Creek. There are many islands and reefs along the coast, including the Great Barrier Reef, Melville Island, Kangaroo Island, and Tasmania. Australia is rich in mineral resources, includ-

ing coal, petroleum, and uranium. A vast diamond deposit was found in Western Austraua in 1979. The country's economy is basically free enterprise; its largest components include finance, manufacturing, and trade. Formally a constitutional monarchy, its chief of state is the British monarch, represented by the governor-general. In reality it is a parliamentary state with two legislative houses; its head of government is the prime minister. Australia has long been inhabited by Aborigines, who began arriving at least 50,000 years ago. Estimates of the population at the time of European settlement in 1788 range from 300,000 to 1,000,000. Widespread European knowledge of Australia began with 17th-century explorations. The Dutch landed in 1616 and the British in 1688, but the first large-scale expedition was that of James Cook in 1770, which established Britain's claim to Australia. The first British settlement, at Port Jackson (1788), consisted mainly of convicts and seamen; convicts were to make up a large proportion of the incoming settlers. By 1859 the colonial nuclei of all Australia's states had been formed, but with devastating effects on the indigenous peoples, whose populations declined sharply with the introduction of European diseases. Britain granted its colonies limited self-government in the mid- 19th century, and an act federating the colonies into a commonwealth went into effect in 1901. Australia fought alongside the British in World War I, notably at Gallipoli, and again in World War II, preventing Australia's occupation by the Japanese. It joined the U.S. in the Korean and Vietnam wars. Since the 1960s the government has sought to deal more fairly with the Aborigines, and a loosening of immigration restrictions has led to a more heterogeneous population. Constitutional links allowing British interference in government were formally abolished in 1968, and Australia has assumed a major role in Asian and Pacific affairs. During the 1990s there were several debates about giving up its British ties and becoming a republic. See map on following page.

Australian Aboriginal languages Group of perhaps as many as 500 languages spoken by the 300,000 to 1,000,000 native inhabitants of Australia before the beginning of European conquest in 1788. More than half are now extinct; of the remainder, only about 20, mostly in the North Territory and northern Western Australia, remain in active use by both adults and children. Most Australian languages belong to a single superfamily, Pama-Nyungan, and the remainder, a very diverse group of languages spoken in the Kimberley region of Western Australia and parts of the North Territory, may be remotely akin to Pama-Nyungan.

Australian Aborigine \a-bo-'ri-j3- l ne\ Any of the indigenous peoples of Australia. The first Australians are estimated to have reached the continent at least 50,000 years ago. At one time there may have been as many as 500 language-named, territorially anchored groups of indigenous Australians. They subsisted as hunters and gatherers. Groups (bands) were formed along the male line (patrilineal descent) and consisted of two or more families. Their lives were centred around a specific site settled by the group's ancestors. The men were custodians of the mythology, ritual, sites, and symbols evoked in the Dreaming. Australian Aborigines are believed to have numbered 300,000-1,000,000 when European colonization began in the late 18th century, but they were devastated by introduced diseases and by the bloody 19th-century policy of "pacification by force." In the early 21st century they were estimated to number more than 400,000. Most aspects of their traditional culture have been severely modified. All Aboriginal peoples have had some contact with modern Australian society, and all are now Australian citizens. At the turn of the 21st century Aboriginal interest in cultural revival was strong.

Australian Alps Mountain range, southeastern Australia. The mountains form the southern end of the Great Dividing Range and the watershed

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between the headstreams of the Murrum-
bidgee River and the rivers flowing south to
the Pacific Ocean. The highest peak is
Mount Kosciusko. The valleys of the Aus-
tralian Alps have been used for grazing, while the highlands have seen
scattered mining ventures.

Australian Ballet Leading ballet company of Australia. It was spon-
sored in 1962 by art patrons interested in promoting a national ballet.
Peggy van Praagh was the first artistic director (1962-74). Since 1965 the
company has toured Europe and North America.

Australian Capital Territory Political entity (pop., 2001: 321,680),
southeastern Australia. A capital territory was mandated by the 1901 Aus-
tralian constitution; the site was chosen in 1908. It lies within New South
Wales and consists of Canberra and the area around Jervis Bay. Parliament
moved there from Melbourne in 1927. In 1989 the Territory received

responsibility for self-government similar to that held by Australian states.

Australian National University Public university in Canberra, Australian Capital Territory. Founded in 1946, it originally offered only graduate programs. Undergraduates were first admitted in 1960, and today the university offers a wide range of graduate and undergraduate programs. Affiliated with the university are research schools of medicine, physical and biological sciences, social sciences, and Pacific studies.

Australian religion Religion of Australia’s Aborigines, based in the Dreaming. Religion involved living in agreement with the way of life ordained in the Dreaming, through the performance of rituals and obedience to the law. Through dreams and other states of altered conscious-

ness, the living could come into contact with the spiritual realm and gain strength from it; myths, dances, and other rituals bound the human, spiritual, and physical worlds together in a single cosmic order. A child’ s spirit was held to come from the dreaming to animate a fetus, and a person’s spiritual heritage was more important than the bond between a physical parent and child. Sacred art included tjurunga, sand and cave paintings, and paintings on bark.

Australian Rules football Variety of football played between two teams of 18 players. The field is oval, 148-202 yd (135-185 m) long, with four goalposts at each end. A six-point goal is scored when the oval ball is kicked through the two central goalposts. A one-point “behind” is scored when the ball is kicked over the behind line extending between the central and outer goalposts. The game’s finest spectacle is the “mark” in which competing players leap, sometimes riding on the back of an opponent, in order to catch the ball directly from the kick of another player. The player making such a catch is awarded a mark, an unhindered kick from behind the spot of the catch. The sport, Australia’s foremost, was developed in Melbourne. The Victorian Football League was established in 1896 as the first professional league. It was renamed the Australian Football League in 1990 to reflect the addition of franchises outside of Victoria state.

Australopithecus Vo-.stra-lo-'pi-ths-kosX Latin "southern ape"

Genus of extinct hominins that may be ancestral to human beings (Homo sapiens). The name Australopithecus refers to the first fossils, which were discovered in South Africa. Australopithecus lived in much of Africa during the Pliocene Epoch (c. 5. 3-1. 8 million years ago [mya]). These hominins were distinguished from apes by their upright posture and bipedal

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gait, and their teeth were more

humanlike than apelike, but their brains were small and not very different from those of living apes. Five species are recognized: A. anamensis (4. 2-3. 9 mya), A. afarensis (3.8-2.9 mya), A. bahrelghazali (3. 5-3.0 mya), A. africanus (3-2.4 mya), and A. garhi (2.5 mya). Three “robust” species are now instead classified as Paranthropus (2.7-1. 3 mya): P. aethiopicus, P. robustus , and P. boisei. Paranthropus eventually became extinct, leaving no evolutionary successors. See also Hadar remains; human evolution; Laetoli footprints; Lucy; Olduvai Gorge; Sterkfontein.

Lateral view of an Australopithecus africanus skull found at Sterkfontein, S.Af.

COURTESY OF THE TRANSVAAL MUSEUM, PRETORIA, S.AF.

Austrasia \o-'stra-zh3\ or Ostrasia \a-'stra-zho\ Early medieval European kingdom. During the Merovingian dynasty (6th-8th centuries ad), it was the eastern Frankish kingdom and Neustria was the western kingdom. Austrasia covered present-day northeastern France and areas of western and central Germany; its capital was at Metz. The region was the power base of the early Carolingian mayors of the palace, one of whom, Pippin III, deposed the last Merovingian king in 751 and founded the Carolingian dynasty. The dynasty’s heartland, Austrasia, was an important region in the empire established by Charlemagne.

Austria officially Republic of Austria Country, south-central Europe. Area: 32,383 sq mi (83,871 sq km). Population (2005 est.): 8,168,000. Capital: Vienna. The population is predominantly Austrian.

Language: German (official). Religions:

Christianity (predominantly Roman Catholic; also Protestant); also Islam. Currency: euro. Much of Austria is covered by Alpine regions, including the eastern Alps,

where the country’s highest point, the Grossglockner, is found. The Bohemian Forest, a highland region, extends north into the Czech Republic. The lowland region, including the Vienna Basin, lies in the east; it supports mainly agricultural activities. The Danube River and its tributaries drain nearly the entire country. Austria has a developed mixed free-market and government-operated economy based on manufacture and commerce; tourism is also important. Austria is a republic with two legislative houses. The chief of state is the president, and the head of government is the chancellor. Austria’s greatest cultural contribution has been in music (see

Joseph Haydn; Wolfgang Amadeus Mozart; Franz Schubert; Alban Berg;

Anton Webern). Major cultural figures in other fields include Oskar Kokoschka in art, Sigmund Freud in psychoanalysis, and Ludwig Wittgenstein in philosophy. Settlement in Austria goes back some 3,000 years, when Illyrians were probably the main inhabitants. The Celts invaded c. 400 bc and established the kingdom of Noricum. The Romans arrived after 200 bc and established the provinces of Raetia, Noricum, and Pannonia; prosperity followed, and the population became Romanized. With the fall of Rome in the 5th century ad, many tribes invaded, including the Slavs; they were eventually subdued by Charlemagne, and the area became ethnically Germanic. The distinct political entity that would become Austria emerged in 976 with Leopold I of Babenberg as margrave. In 1278 Rudolf IV of Habsburg (later Rudolf I as the king of Germany) conquered the area; Habsburg rule lasted until 1918. While in power, the Habsburgs created a kingdom centred on Austria, Bohemia, and Hungary. The Napoleonic Wars brought about the end of the Holy Roman Empire (1806) and the emergence of the Austrian Empire. The prince von Metternich tried to assure Austrian supremacy among Germanic states, but war with Prussia led Austria to divide the empire into the Dual Monarchy of Austria-Hungary. Nationalist sentiment plagued the kingdom, and the assassination of Francis Ferdinand by a Bosnian Serb nationalist in 1914 triggered World War I, which destroyed the Austro-Hungarian Empire. In the postwar carving up of Austria-Hungary, Austria became an independent republic. It was annexed by Nazi Germany in 1938 (see Anschluss) and joined the Axis powers in World War II. The republic was restored in 1955 after 10 years of Allied occupation. Austria became a full member of the European Union (EU) in 1995. After a half-century of military neutrality, Austria was one of the few members of the EU that was not a member of NATO at the outset of the 21st century.

Austria-Hungary or Austro-Hungarian Empire Former monarchy, central Europe. Austria-Hungary at one time included Austria and Hungary, Bohemia, Moravia, Bukovina, Transylvania, Camiola, Ktistenland, Dalmatia, Croatia, Fiume, and Galicia. The so-called Dual Monarchy, formed by the Compromise of 1 867, created a king of Hungary in addition to the existing Austrian emperor; though these were the same person, Hungary was granted its own parliament and considerable autonomy. Francis Joseph held both titles from Austria-Hungary’s inception until his death in 1916. Up to 1914, the monarchy maintained a precarious balance among its many minorities; that year saw the balance toppled with the assassination of the Austro-Hungarian Francis Ferdinand by a Serbian nationalist that precipitated World War I. With its defeat in that war and revolutions by the Czechs, Yugoslavs, and Hungarians, the monarchy collapsed in 1918.

Austrian Netherlands (1713-95) Provinces located in the southern part of the Low Countries, roughly comprising modern Belgium and Luxembourg. In 1713, the Peace of Utrecht gave Emperor Charles VI control of what had been called the Spanish Netherlands. Administration of the region continued under the Habsburg rulers Maria Theresa and later Joseph II. until the Austrian Netherlands was annexed to France in 1795.

Austrian school of economics Body of economic theory developed by several late 19th-century Austrian economists. Carl Menger (1840-1921) published a paper on their new theory of value in 1871. The concept of value was subjective, the source of a product’s value being its

ability to satisfy human wants. The actual value depended on the utility derived by the consumer from the product in its least important use (marginal utility). The theory was also applied to production and pricing. Other founders of the school included Friedrich von Wieser (1851-1926) and Eugen von Bohm-Bawerk (1851-1914). See also opportunity cost; productivity.

Austrian Succession, War of the (1740^-8) Group of related wars that took place after the death (1740) of Emperor Charles VI. At issue was the right of Charles's daughter Maria Theresa to inherit the Habsburg lands. The war began when Frederick II of Prussia invaded Silesia in 1740. His victory suggested that the Habsburg dominions were incapable of defending themselves, prompting other countries to enter the fray. The conflict was ended by the Treaty of Aix-la-Chapelle.

Austro-German Alliance or Dual Alliance (1879) Pact between Austria-Hungary and the German Reich in which the two powers promised each other support in case of attack by Russia, and neutrality in case of aggression by any other power. Germany's Otto von Bismarck saw the alliance as a way to prevent the isolation of Germany and to preserve peace, as Russia would not wage war against both empires. The addition

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of Italy in 1882 made it the Triple Alliance. The agreement remained an important element of both German and Austro-Hungarian foreign policy until 1918.

Austro-Hungarian Empire See Austria-Hungary
Austro-Prussian War See Seven Weeks' War

Austroasiatic languages Superfamily of about 150 languages spoken by close to 90 million physically and culturally very diverse people in South and Southeast Asia. Today most scholars believe that it is subdivided into two families, Munda and Mon-Khmer. The present fragmented distribution of Austroasiatic languages is most likely the result of relatively recent incursions by Indo-Aryan, Sino-Tibetan, Tai, and AusTRONESiAN-speaking peoples. In prehistoric times Austroasiatic languages most likely extended over a much broader and more continuous area, including much of what is now southeastern China. Other than Vietnamese and Khmer, no Austroasiatic language is an official national language.

Austronesian languages formerly Malayo-Polynesian languages Family of about 1,200 languages spoken by more than 200 million people in Indonesia, the Philippines, Madagascar, the central and southern Pacific island groups (except most of New Guinea; see Papuan languages), and parts of mainland Southeast Asia and Taiwan. Before European colonial expansion, it had the widest territorial extent of any lan-

guage family. A primary genetic division in the family separates the Austronesian languages of Taiwan from the remaining languages, which are divided into Western and Central-Eastern Malayo-Polynesian. Western Malayo-Polynesian includes Javanese, which is spoken by about 76 million people — more than a third of all Austronesian-speakers. Eastern Malayo-Polynesian includes Oceanic, the best-defined subgroup of Austronesian, comprising nearly all the languages of Polynesia, Micronesia, and Melanesia. Typological generalizations about Austronesian languages are difficult because of their enormous number and diversity, though content words tend to be disyllabic, and vowel and consonant inventories tend to be limited, especially in Polynesian. Written records in scripts of Southeast Asian provenance (see Indic writing system) survive for several languages, including Old Javanese and Cham, the language of the kingdom of Champa.

auteur \o-'toer\ theory Theory that holds that a film's director is its "author" (French, auteur). It originated in France in the 1950s and was promoted by Francois Truffaut and Jean- Luc Godard and the journal Cahiers du Cinema. The director oversees and "writes" the film's audio and visual scenario and therefore is considered more responsible for its content than the screenwriter. Supporters maintain that the most successful films bear the distinctive imprint of their director.

authoritarianism Principle of unqualified submission to authority, as opposed to individual freedom of thought and action. As a political system, authoritarianism is antidemocratic in that political power is concentrated in a leader or small elite not constitutionally responsible to those governed. It differs from totalitarianism in that authoritarian governments usually lack a guiding ideology, tolerate some pluralism in social organization, lack the power to mobilize the whole population in pursuit of national goals, and exercise their power within relatively predictable limits. See also absolutism, dictatorship.

autism Neurobiological disorder that affects physical, social, and language skills. First described by Leo Kanner and Hans Asperger in the 1940s, the syndrome usually appears before IVi years of age. Autistic infants appear indifferent or averse to affection and physical contact. They may be slow in learning to speak and suffer episodes of rage or panic; they may also appear deaf and display an almost hypnotized fascination with certain objects. Autism is often characterized by rhythmic body movements such as rocking or hand-clapping and by an obsessive desire to prevent change in daily routines. Autistic individuals may be hypersensitive to some stimuli (e.g., high-pitched sounds) and abnormally slow to react to others (e.g., physical pain). The disorder is three to four times more common in males. Though postnatal factors such as lack of parental attention were once blamed, it is now known that autism is the result of abnormalities in the brain structure. About 15-20% of autistic adults live and work independently; "high-functioning" autistic people may have special abilities based on their unusual ability for visual thinking. See also SAVANT SYNDROME.

auto sacramental Vau-to-.sa-kra-men-'taL Spanish "sacramental act" Spanish dramatic genre of short plays on sacred or biblical subjects.

Performed outdoors as part of Corpus Christi feast-day celebrations, they were verse allegories dealing with some aspect of the mystery of the Holy Eucharist. The form first appeared in the 16th century and reached its height in plays by Pedro Calderon de la Barca, who covered a wide range

of nonsacramental subjects. Their performance was prohibited by royal decree in 1765 on the ground of irreverence.

autobiography Biography of oneself narrated by oneself. Little autobiographical literature exists from antiquity and the Middle Ages; with a handful of exceptions, the form begins to appear only in the 15th century. Autobiographical works take many forms, from intimate writings made during life that are not necessarily intended for publication (including letters, diaries, journals, memoirs, and reminiscences) to the formal autobiography. Outstanding examples of the genre extend from St. Augustine's Confessions (c. ad 400) to Vladimir Nabokov's Speak, Memory (1951).

autoclave Vessel, usually of steel, able to withstand high temperatures and pressures. The chemical industry uses various types of autoclaves in manufacturing dyes and in other chemical reactions requiring high pressures. In bacteriology and medicine, instruments, equipment, supplies, and culture media are sterilized by superheated steam in an autoclave. In 1679 Denis Papin (1647-c. 1712) invented a prototype known as a steam digester; still used in cooking, it is now called a pressure cooker.

autograph Any manuscript handwritten by its author; in common usage, a handwritten signature. Aside from its value as a collector's item, an early or corrected draft of a work may show its stages of composition or "correct" final version. The earliest autograph signature of a famous person is probably the Cid's, dated 1096. There exist autographs of most of the great Renaissance figures, including Leonardo da Vinci, Michelangelo, and Ludovico Ariosto. Since the 1 8th century, autograph material of notable people in the arts, sciences, or public life has been more abundant.

autoimmune disease Any disease caused by an immune response (see immunity) against antigens in the tissues of one's own body. The immune system has two known ways to prevent such a response: destruction of lymphocytes in the thymus before they leave to attack one's own tissues and loss of ability to react to their target antigens by any such cells that do leave the thymus. Autoimmune diseases arise when these mechanisms fail and lymphocytes destroy host tissues; examples include type 1 diabetes mellitus, systemic lupus erythematosus, pernicious anemia, and rheumatoid arthritis. Treatment may replace the function of the affected tissue (e.g., insulin therapy for diabetes) or suppress the immune system (see immunosuppression). Allergy is another type of autoimmune reaction.

automata fo-'ta-mo-toX theory Body of physical and logical principles underlying the operation of any electromechanical device (an automaton) that converts information input in one form into another, or into some action, according to an algorithm. Norbert Wiener and Alan M. Turing are regarded as pioneers in the field. In computer science, automata theory is concerned with the construction of robots (see robotics) from basic building blocks of automatons. The best example of a general automaton is an electronic digital computer. Networks of automata may be designed to mimic human behaviour. See also artificial intelligence; Turing MACHINE.

automation Term coined about 1946 by a Ford Motor Co. engineer, used to describe a wide variety of systems in which there is a significant substitution of mechanical, electrical, or computerized action for human effort and intelligence. In general usage, automation can be defined as a technology concerned with performing a process by means of programmed commands combined with automatic feedback control (see con-

trol system) to ensure proper execution of the instructions. The resulting system is capable of operating without human intervention.

automatism Xo-'ta-mo-.tiz-omX Method of painting or drawing in which conscious control over the movement of the hand is suppressed so that the subconscious mind may take over. For some Abstract Expressionists, such as Jackson Pollock, the automatic process encompassed the entire process of composition. The Surrealists, having once achieved an interesting image or form by automatic or chance means, exploited the technique with fully conscious purpose. See also Abstract Expressionism, ACTION PAINTING, SURREALISM.

automaton Xo-'ta-mo-tonX Mechanical object, either functional (such as a clock) or decorative (such as a miniature singing bird), that is self-operating. Devices set in motion by water, falling weights, and steam were in use in the 1st century. Decorative mechanical objects were made for

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ecclesiastical use and table ornaments in the Middle Ages and Renaissance. Spectacular fountains and waterworks can be seen in 16th-century Italian gardens; elaborate mechanical devices (such as the chess-playing Turk) were popular in the 18th- 19th century. Except for some works by Carl Faberge, the production of expensive automatons virtually ceased by the 20th century.

automobile Four-wheeled automotive vehicle designed for passenger transportation, commonly propelled by an internal combustion engine using a volatile fuel. The modem automobile consists of about 14,000 parts, divided into several structural and mechanical systems. These include the steel body, containing the passenger and storage space, which sits on the chassis or steel frame; the internal combustion gasoline engine, which powers the car by means of a transmission; the steering and braking systems, which control the car’s motion; and the electrical system, which includes a battery, alternator, and other devices. Subsystems involve fuel, exhaust, lubrication, cooling, suspension, and tires. Though experimental vehicles were built in the 18th and mid- 19th century, not until the 1880s did Gottlieb Daimler and Karl Benz in Germany begin separately to manufacture cars commercially. In the U.S., James and William Packard and Ransom Olds were among the first auto manufacturers, and by 1898 there were 50 U.S. manufacturers. Some early cars operated by steam engine, such as those made from c. 1902 by Francis E. and Freelan O. Stanley. The internal combustion engine was used by Henry Ford when he introduced the Model T in 1908; Ford would soon revolutionize the industry with his use of the assembly line. In the 1930s European manufacturers began to make small, affordable cars such as the Volkswagen. In the 1950s and ’60s, U.S. automakers produced larger, more luxurious cars with more automatic features. In the 1970s and ’80s Japanese manufacturers exported their small, reliable, fuel-efficient cars worldwide, and their increasing popularity spurred U.S. automakers to produce similar models. See also axle, brake, bus, carburetor, electric automobile, fuel injection, motor-

cycle, TRUCK.

automobile racing Sport practiced in a variety of forms on roads, tracks, or closed circuits. It includes Grand Prix racing, speedway racing (including the Indianapolis 500), stock-car racing, sports-car racing, drag racing, midget-car racing, and karting, as well as hill climbs and rally driving. The International Motor Sports Hall of Fame is located in Talladega, Ala., U.S. There is no central governing body for automobile racing in the U.S. as there is in most other countries.

autonomic \,6t-9-'nam-ik\ nervous system Part of the nervous system that is not under conscious control and that regulates the internal organs. It includes the sympathetic, parasympathetic, and enteric nervous systems. The first, which connects the internal organs to the brain via spinal nerves, responds to stress by increasing heart rate and blood flow to the muscles and decreasing blood flow to the skin. The second comprises the cranial nerves and the lower spinal nerves, which increase digestive secretions and slow the heartbeat. Both have sensory fibres that send feedback on the condition of internal organs to the central nervous system, information that helps maintain homeostasis. The third division, embedded in the walls of the stomach and intestines, controls digestive movement and secretions. See illustration opposite.

autopsy \'6-,tap-se\ or necropsy or postmortem Dissection and examination of a dead body to determine cause of death and learn about disease processes in ways that are not possible with the living. Autopsies have contributed to the development of medicine since at least the Middle Ages. Beyond revealing causes of individual deaths, autopsy is crucial to the accuracy of disease and death statistics, the education of medical students, the understanding of new and changing diseases, and the advancement of medical science.

Autry, (Orvon) Gene (b. Sept. 29, 1907, Tioga, Texas, U.S. — d. Oct. 2, 1998, North Hollywood, Calif.) U.S. actor and singer. He made his debut on a local radio show in 1928, hosting his own radio program from 1931. His first film. In Old Santa Fe (1934), launched his career as a cowboy actor. Known as “the Singing Cowboy,” he starred in 18 movies, ending with Alias Jesse James (1959). His recordings, including “Rudolph the Red-Nosed Reindeer” (1949), sold millions of copies. The televised Gene Autry Show ran from 1950 to 1954.

autumn crocus Any plant of the genus Colchicum (lily family), sometimes called meadow saffron, comprising about 30 species of herbaceous plants native to Eurasia. The stemless, crocuslike flowers bloom in autumn. Several species are cultivated as ornamentals for their pink,

white, or bluish-purple tubelike flowers, especially C. autumnale, C. bornmuelleri, and C. speciosum. The swollen underground stem of C. autumnale contains colchicine, a substance used to relieve the pain of gout.

Auvergne \o-'vern y \ Region (pop., 1999: 1,308,878), south-central France. It was once inhabited by the Arverni, a Gallic people led by Vercingetorix and defeated by Julius Caesar. It was yielded to the Visigoths in ad 475 and conquered by the Franks under Clovis I in 507. It became part of Aquitaine, and in the 8th century it was made a countship. It passed to the Bourbons in 1416 and to France c. 1530.

auxiliary In grammar, a verb that is subordinate to the main lexical verb in a clause. Auxiliaries can convey distinctions of tense, aspect, mood, person, and number. In Germanic languages such as English and Romance languages such as French, an auxiliary verb occurs with the main verb in the form of an infinitive or participle.

auxin Any of a group of hormones that regulate plant growth, particularly by stimulating cell elongation in stems and inhibiting it in roots. Auxins influence the growth of stems toward light (phototropism) and against the force of gravity (geotropism). Auxins also play a role in cell division and differentiation, fruit development, the formation of roots from cuttings, the inhibition of lateral branching, and leaf fall. The most important naturally occurring auxin is beta-indolylacetic acid.

Ava \'a-va\ Ruined city, Myanmar. The city, located on the Irrawaddy River southwest of Mandalay, was founded in the 14th century by the Shans, who made it their capital. It was destroyed in 1527, but again became the capital in 1634 under the Toungoo dynasty. When Alaung-

lacrimal gland,

salivary

gland

ganglion

heart

heart

spleen

stomach

plexus

I bladder

eye

nasal

mucosa

nasal / > —

mucosa U* parotid

liver

mm-"" /

i -"stomach

small ^ j y\
intestine /

large

intestine

T12

female V !'

male

male

spinal cord

female

bladder

genital

organs

genital

organs

sympathetic
— parasympathetic

Pathways of the autonomic nervous system. Nerve impulses begin in motor neurons in the brain or spinal cord. Each motor neuron connects with a second motor neuron outside the central nervous system to carry the impulse to the glands and smooth muscles. In the sympathetic nervous system, these second motor neurons are found in ganglia (masses of neurons) along either side of the spinal cord. In the parasympathetic nervous system, ganglia are located closer to, or sometimes within, the target organs. Some ganglia form large clusters called plexuses. Preganglionic fibres of the sympathetic system emerge along the thoracic (T) and first three lumbar (L) segments of the spinal cord. Fibres of the parasympathetic system originating in the brainstem arise from the third, seventh, ninth, and tenth cranial nerves; other parasympathetic fibres emerge from the second, third, and fourth sacral (S) segments of the spinal cord.

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paya founded the Konbaung dynasty in the 18th century, Ava served as its capital for a time, and even after the dynasty built Amarapura and Mandalay, its seat was often referred to as the “Court of Ava.”

avalanche Large mass of material, such as snow or rock debris, that moves rapidly down a mountain slope, sweeping everything in its path. Avalanches begin when a mass of material overcomes the frictional resistance of the sloping surface, often after the material’s foundation has been weakened by rains or the snow has been partially melted by a warm, dry wind. Other weather conditions that can lead to avalanches are heavy snowfall and high winds. A common method of avalanche control consists of detonating explosives in the upper reaches of avalanche zones, which intentionally causes the snow to slide before accumulations have become very great.

Avalokitesvara ^o-vo-.lo-ki-'tash-vo-roV Chinese Guanyin \'gwan-'yin\ Japanese Kannon Ykan-'n6n\ Bodhisattva of infinite compassion and mercy, the most popular of Mahayana Buddhist deities. He is the earthly manifestation of Amitabha, guarding the world between the departure of the historical Buddha, Gautama, and the appearance of the future Buddha,

Maitreya. He is the creator of the fourth world, the actual living universe. In China and Japan his gender became ambiguous; he is sometimes called a goddess. For Pure Land Bud-

dhists, he forms a ruling triad with Amitabha and the bodhisattva Mahasthamaprapta. In Tibetan Buddhism, he is thought to be reincarnated in each Dalai Iama in order to preserve buddha-teaching.

Avalon Island to which Britain's legendary King Arthur was taken after he was mortally wounded in his last battle. First described by Geoffrey of Monmouth, it was said to be ruled by Morgan le Fay and her eight sisters, all of whom were skilled in the healing arts. Legend held that when Arthur was healed he would return to rule Britain. The tale may have originated in Celtic myths of an elysium for fallen heros. Avalon has sometimes been identified with Glastonbury in Somerset.

Avanti Historic kingdom, north-central India. Located on the overland trade routes between northern and southern India, it lay within present-day Madhya Pradesh. Its capital was at Ujjayini (near present-day Ujjain). It flourished in the 6th — 4th centuries bc as one of the great powers of northern India. In the 4th century bc it was conquered and annexed by Candra Gupta Maurya of Magadha. Ujjayini, one of the seven holy cities of Hinduism, was renowned for its beauty and wealth; it also became a centre of early Buddhism and Jainism.

Avar \'a-var\ Any member of a people of undetermined origin who built an empire in eastern Europe between the Adriatic and Baltic seas and the Elbe and Dnieper rivers in the 6th-9th centuries. Mounted nomads, possibly from Central Asia, they made the Hungarian plain the centre of their empire, from which they intervened in Germanic tribal wars, helped the Lombards overthrow allies of Byzantium, and nearly succeeded in occupying Constantinople in 626. They also fought the Merovingians and helped push the Serbs and Croats southward. Avar decline began in the late 7th century and culminated in the destruction of their capital by Charlemagne in 796. In the early 9th century the Avars were fully incorporated in the Carolingian empire.

Avatamsaka-sutra V.o-vo-'tom-so-ko-'su-troN or Garland Sutra

Mahayana Buddhist sutra that explores the teachings of the Buddha Gautama. It speaks of the deeds of the Buddha and the resulting merits that blossom like a garland of flowers. It begins with the Buddha's Enlighten-

ment attended by a chorus of bodhisattvas and divine beings. It describes an assembly in the palace of Indra, where the Buddha teaches that all beings have the Buddha nature. Around ad 400 a Chinese translation appeared, Huayan jing, which gave rise in the 6th century to the Huayan sect, which became in Japan the Kegon school. See also Vairocana.

avatar Ya-v9-,tar\ In Hinduism, the incarnation of a deity in human or animal form to counteract an evil in the world. It usually refers to 10

appearances of Vishnu, including an incarnation as the Buddha Gautama and Kalkin (the incarnation yet to come). The doctrine appears in the Bhagavadgita in the words of Lord Krishna to Arjuna: “Whenever there is a decline of righteousness and rise of unrighteousness then I send forth Myself.”

Avebury Vav-b3-re\ Village, Wiltshire, England, lying partly within one of the largest prehistoric sites in Europe. The site occupies 28.5 acres (1 1 .5 hectares) and contains vast megalithic remains, including chalk blocks and sandstone pillars placed in circles. Its date and origin are uncertain. Kennet Avenue, a route into the interior of the great circle, linked Avebury with a temple 1 mi (1.6 km) away.

Avedon Va-vs-.danX, Richard (b. May 15, 1923, New York, N.Y., U.S. — d. Oct. 1, 2004, San Antonio, Texas) U.S. photographer. He began studying photography in the U.S. merchant marine. In 1945 he became a regular contributor to Harper's Bazaar, he later was closely associated with Vogue. Avedon’ s fashion photographs are characterized by a strong black-and-white contrast that creates an effect of austere sophistication. In his portraits of celebrities and other sitters, he created a sense of drama by often using a stark, white background and eliciting a frontal, confrontational pose. Many collections of his photographs have been published.

averts \'a-venz\ Any of the low-growing, perennial flowering plants (approximately 50 species) of the genus Geum, in the rose family. Most occur in the northern or southern temperate zones or in the Arctic. Several species are cultivated for their solitary or clustered white, red, orange, or yellow flowers. The plants grow no more than 2 ft (60 cm) tall. Most of the compound, deeply lobed or cut leaves arise from the base of the stem.

average See mean, median, and mode

Avernus \9-'v3r-n9s\, Lake ancient Lacus Avernus. Lake, southern Italy. It lies west of Naples in the crater of an extinct volcano. Because of its sulfurous vapors, it was considered an entrance to the underworld by the ancient Romans, including Virgil. According to legend, the grove of Hecate and the grotto of the Cumaean Sibyl lay nearby. In the 1st century bc it was transformed into a naval base, Portus Iulius, by Agrippa and linked to the sea. Its impressive Roman ruins include baths, temples, and villas.

Averroes \9-'ver-9-,wez \ Arabic Ibn Rushd V.ib-sn-'rushtV in full Abu al-Walld Muhammad ibn Ahmad ibn Muhammad ibn Rushd (b. 1126, Cordoba — d. 1 198, Marrakech, Almohad empire) Spanish Arabic philosopher. Trained in law, medicine, and philosophy, he rose to be chief judge of Cordoba, an office also once held by his grandfather. His series of commentaries on most of the works of Aristotle, written between 1169 and 1195, exerted considerable influence on both Jewish and Christian scholars in later centuries. While mostly faithful to Aristotle’s thought, he endowed the Aristotelian “prime mover” with the characteristics of the Plotinian (see Plotinus) and Islamic transcendent God, the universal First Cause. In his Commentary on Plato's Republic he attempted to apply Platonic doctrines to the contemporary Almoravid and Almohad states. See also Arabic philosophy.

Avery, Oswald (Theodore) (b. Oct. 21, 1877, Halifax, N.S., Can. — d. Feb. 20, 1955, Nashville, Tenn., U.S.) Canadian-born U.S. bacteriologist. He studied at Colgate University before taking a post at New York’s Rockefeller Institute Hospital. There he discovered transformation,

a process by which a change could be introduced into bacteria and passed on to later generations of transformed cells. He and his co workers reported in 1944 that the substance that caused the transformation was DNA, the cell's genetic material. The discovery thus opened the door to deciphering the GENETIC CODE.

Avesta \9-'ves-t9\ or Zend-Avesta Sacred book of Zoroastrianism. It contains hymns, prayers, and appeals to righteousness ascribed to Zoroaster. The present text was assembled in the 3rd-7th century ad from the remains of a larger body of scripture that was destroyed when Alexander the Great conquered Persia. It has five parts: the Gathas, hymns in what are thought to be Zoroaster's own words; Visp-rat, containing homages

Avalokitesvara, bronze figure from Kurkihar, Bihar, 9th century; in Patna Museum, Patna, Bihar

BY COURTESY OF PATNA MUSEUM, PATNA (BIHAR); PHOTOGRAPH, ROYAL ACADEMY OF ARTS, LONDON

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to spiritual leaders; Vendidad, the main source for Zoroastrian law; the Yashts, 21 hymns to angels and ancient heroes; and the Khurda avesta, composed of minor texts.

Avestan \3-'ves-t3n\ language Eastern Iranian language of the Avesta, the sacred book of Zoroastrianism. The oldest portion of the Avesta, the Gathas, are now commonly thought to date from around the end of the 2nd millennium bc and are thus contemporary with Vedic Sanskrit. Not until the mid-SASANiAN period (5 th— 6th century ad) was the Avesta committed to writing, in an alphabetic script invented for the purpose on the basis of existing Middle Persian scripts. The oldest manuscripts date only from the 13th century.

aviary Structure for keeping captive birds, usually spacious enough for the aviculturist to enter. Aviaries range from small enclosures to large flight cages 100 ft (30 m) or more long and up to 50 ft (15 m) high. Enclosures for birds that fly only little or weakly (e.g., rails, pheasants) may be only about 3 ft (1 m) high. In cold climates the aviary is usually enclosed and heated. Most aviculturists prefer to place birds in natural, planted surroundings. Many aviaries are maintained for pleasure by private aviculturists; others, especially large ones, are found in zoos or research institutions.

aviation Development and operation of aircraft. In 1783 the balloon became the first aircraft to carry humans. Production of a successful glider in 1891 and refinement of the internal-combustion engine led to the first successful engine-powered airplane flight by Wilbur and Orville Wright in

1903. World War I accelerated the expansion of aviation, and in the 1920s the first small airlines began carrying mail and passengers. World War II was another period of innovation in aircraft size, speed, and range. In the late 1940s the jet engine made possible the subsequent development of commercial airlines throughout the world. See also airship; helicopter; sea-plane.

Avicenna V.a-vo-'se-noV Arabic Ibn STna \'ib-9n-'se-na\ in full Abu ’All al-Husayn ibn *Abd Allah ibn STna (b. 980, Bukhara, Iran — d. 1037, Hamadan) Islamic philosopher and scientist. He became physician to several sultans and also twice served as vizier. His Canon of Medicine was long a standard work in the field. He is known for his great encyclopaedia of philosophy, The Book of Healing. His other writings include The Book of Salvation and The Book of Directives and Remarks. His interpretations of Aristotle influenced European Scholasticism. His system rests on a conception of God as the necessary existent: only in God do essence (what God is) and existence (that God is) coincide.

Avignon \,a-ve-'ny6 n \ ancient Avennio City (pop., 2004 prelim.: 89,400), southeastern France. Founded by the Gallic tribe of Cavares, it later fell under Roman rule and was a much-fought-over prize in its early days. Its status grew tremendously as the capital of the papacy (1309-77) and seat of the Avignonese popes during the Western Schism. France annexed the city in 1791. Landmarks include a Romanesque cathedral, the papal palace, and Saint-Benezet bridge, made famous by the song “Sur le pont d’ Avignon.” The city’s historic centre was designated a World Heritage site in 1995.

Avignon papacy Roman Catholic papacy during the period 1309-77, when the popes resided at Avignon, France. Elected pope through the machinations of Philip IV of France, Clement V moved the papal capital to Avignon four years later primarily for political reasons. All seven popes of this period were French, as were most of the cardinals, which aroused English and German animosity. During the Avignon papacy the cardinals began to play a stronger role in church government, church and clergy were reformed, missionary efforts were expanded, and popes tried to settle royal rivalries and establish peace. The heavy French influence damaged the prestige of the papacy, however, and in 1377 Gregory XI returned to Rome. The cardinals elected a new pope who took the Avignon seat, becoming the first of a line of antipopes and beginning the Western Schism.

Avignon school School of late Gothic painting associated with the city of Avignon, Fr., during the Avignon papacy, when many Italian artists worked there. This “school” represents a body of late Gothic painting and not necessarily a single stylistic evolution. Under the direction of Simone Martini, the papal palace of Avignon and secular buildings in nearby towns were decorated with frescoes. The city was one of the channels by which Italian 14th-century art reached France. By the early 15th century Flemish influences had reached the city, consolidating the Italian and northern styles. The Avignon Pieta (c. 1460), attributed to Enguerrand Charonton,

is the masterpiece of the school. The artistic activity at Avignon greatly influenced French painting in the late 15th and 16th centuries. See also Gothic art.

Aviles, Pedro Menendez de See Pedro Menendez de Aviles

Avogadro's number Number of units in one mole of any substance (defined as its molecular weight in grams), equal to 6.0221367 x 10 23 . The units may be electrons, atoms, ions, or molecules, depending on the nature of the substance and the character of the reaction (if any). See also Avogadro's law; law of mass action; stoichiometry.

avoidance, zone of Region of apparent absence of galaxies near the plane of the Milky Way Galaxy. Millions of external galaxies are in this region of the sky but are obscured by interstellar dust within the Milky Way. The zone’s obscuration can be penetrated at the infrared portion of the ELECTROMAGNETIC SPECTRUM. See also INFRARED ASTRONOMY.

avoidance behaviour Type of activity, exhibited by animals exposed to adverse stimuli, in which the tendency to flee or to act defensively is stronger than the tendency to attack. Vision is the sense that most often produces avoidance behaviour (e.g., small birds react to the sight of an owl), but sound (e.g., a warning cry) may do so as well.

Avon, River or Lower Avon River, southwestern England. Rising in Gloucestershire, it flows 75 mi (121 km) southwest through Bristol and into the Bristol Channel at Avonmouth, Bristol’s port. Below Bristol it has cut through a limestone ridge to form Clifton Gorge, noted for its suspension bridge.

Avon, River or Upper Avon River, central England. Rising in Northamptonshire, it flows 96 mi (154 km) southwest into the River Severn at Tewkesbury. It is known for its scenic beauty, notably in the Vale of Evesham. Important towns along it include Stratford, where William Shakespeare was born.

avocado Fruit of Persea americana, of the laurel family, a tree native to the Western Hemisphere from Mexico south to the Andean regions.

Avocados are extremely variable in shape, size, and colour (green to dark purple). The outer skin may be thin, or coarse and woody. The greenish or yellowish flesh has a buttery consistency and a rich, nutty flavour. In some varieties the flesh contains as much as 25% unsaturated oil. Avocados are the principal ingredient of the Mexican sauce guacamole. They provide thiamine, riboflavin, and vitamin A.

avocet Va-v3-,set\ Any of several large shorebirds (genus Recurvirostra) with boldly contrasting plumage, long bluish legs, and a long black bill upturned at the tip. Avocets inhabit fresh and salt marshes that have areas of open shallow water and

mudflats, and feed by sweeping the partly open bill in the shallows. They often wade together to corral minnows and crustaceans. Four avocet species are found in temperate and tropical regions worldwide. The American avocet is about 18 in. (45 cm) long, including the bill.

Avogadro's law ^a-vo-'ga-drozX
Statement that, under the same conditions of TEMPERATURE and PRESSURE, equal volumes of different GASes

contain an equal number of molecules (see Avogadro's number). First proposed by the Italian scientist Amedeo Avogadro (1776-1856) in 1811, it became accepted c. 1860. From the law, it follows that the volume occupied by one mole of gas (at standard conditions of 32 °F [0 °C] and 1 atmosphere of pressure) is the same for all gases (0.791 cubic feet [22.4 litres]).

Avocado (Persea americana).

S.A. SCIBOR-SHOSTAL

American avocet (Recurvi rostra americana)

MILDRED GLUECK FROM ROOT RESOURCES- EB INC.

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AWACS \'a-waks\ (Airborne Warning and Control System)

Mobile, long-range radar surveillance-and-control centre for air defense. Used by the U.S. Air Force since 1977, AWACS is mounted in a specially modified Boeing 707 aircraft, with its main radar antenna affixed to a rotating dome. It can detect, track, and identify low-flying aircraft at a distance of 200 nautical mi (370 km) and high-level targets at much greater distances. It can also track maritime traffic and operate in any weather. The computer system can assess enemy action and track the location and availability of any aircraft within range. Operators of its secure communications system can guide friendly aircraft against enemy planes.

Awakening, Great See Great Awakening

Awolowo \a-'wu-lo-,wo\, Obafemi (b. March 6, 1909, Ikenne, Colony and Protectorate of Southern Nigeria — d. May 9, 1987, Ikenne)

Nigerian nationalist politician and leader of the Yoruba ethnic group. While studying law in London, he wrote the influential Path to Nigerian Freedom (1947) and laid the basis for the first Yoruba political party, the Action Group. As premier of Nigeria's Western Region (1954-59), he worked to improve education, social services, and agriculture. He remained a major figure in national politics but never won high elective office.

ax Hand tool used for chopping, splitting, chipping, and piercing. Stone Age hand axes originated in simple stone implements that acquired wooden hafts, or handles, about 30,000 bc. Copper-bladed axes appeared in Egypt about 4000 bc and were followed by axes with blades of bronze and eventually iron. The development of the iron-bladed felling ax in the Middle Ages made possible the vast forest clearances of Europe, North and South America, and elsewhere. Though the ax has lost much of its historic role to powered saws and other machinery, it remains a widely used tool with many uses.

axiology or value theory Philosophical theory of value. Axiology is the study of value, or goodness, in its widest sense. The distinction is commonly made between intrinsic and extrinsic value — i.e., between that which is valuable for its own sake and that which is valuable only as a means to something else, which itself may be extrinsically or intrinsically valuable. Many different answers have been given to the question "What is intrinsically valuable?" For hedonists, it is pleasure; for pragmatists, it is satisfaction, growth, or adjustment; for Kantians, it is a good will. Pluralists such as G.E. Moore and William David Ross assert that there are any number of intrinsically valuable things. According to subjective theories of value, things are valuable only insofar as they are desired; objective theories hold that there are at least some things that are valuable independently of people's interest in or desire for them. Cognitive theories of value assert that ascriptions of value function logically as statements of fact, whereas noncognitive theories assert that they are merely expressions of feeling (see emotivism) or prescriptions or commendations (see prescriptivism). According to naturalists, expressions such as "intrinsically good" can be analyzed as referring to natural, or non-ethical, properties, such as being pleasant. Moore famously denied this, holding that "good" refers to a simple (unanalyzable) non-natural property. See also fact-value distinction; naturalistic fallacy.

axiom In mathematics or logic, an unprovable rule or first principle accepted as true because it is self-evident or particularly useful (e.g., "Nothing can both be and not be at the same time and in the same respect"). The term is often used interchangeably with postulate , though the latter term is sometimes reserved for mathematical applications (such as the postulates of Euclidean geometry). It should be contrasted with a theorem, which requires a rigorous proof.

axiomatic method In logic, the procedure by which an entire science or system of theorems is deduced in accordance with specified rules by logical deduction from certain basic propositions (axioms), which in turn are constructed from a few terms taken as primitive. These terms may be either arbitrarily defined or conceived according to a model in which some intuitive warrant for their truth is felt to exist. The oldest examples of axiomatized systems are Aristotle's syllogistic and Euclidean geometry. Early in the 20th century, Bertrand Russell and Alfred North Whitehead attempted to formalize all of mathematics in an axiomatic manner. Scholars have even subjected the empirical sciences to this method, as in J. H. Woodger's The Axiomatic Method in Biology (1937) and Clark Hull's

Principles of Behavior (1943).

Axis Powers Coalition headed by Germany, Italy, and Japan that opposed the Allied Powers in World War II. The alliance originated in a

series of agreements between Germany and Italy, followed in 1936 by the Rome-Berlin Axis declaration and the German- Japanese Anti-Comintern Pact. The connection was strengthened by the formal Pact of Steel (1939) between Germany and Italy and by the Tripartite Pact signed by all three powers in 1940. Several other countries, including Hungary, Romania, Bulgaria, Croatia, and Slovakia, later allied themselves with the original Axis Powers.

axle Pin or shaft on or with which wheels revolve; with fixed wheels, one of the basic simple machines for amplifying force. Combined with the wheel, in its earliest form it was probably used for raising weights or water buckets from wells. Its principle of operation can be illustrated in the attachment of large and small gears to the same shaft; the tendency of a force applied at the radius on the large gear to turn the shaft is sufficient to overcome a larger force at the radius on the small gear. The mechanical advantage is equal to the ratio of the two forces and also equal to the ratio of the radii of the two gears.

Axminster carpet Floor covering produced in a factory founded at Axminster, England, in 1755 by the cloth weaver Thomas Whitty. The carpets were knotted in wool on woolen warps, with wefts of flax or hemp, and featured Renaissance architectural or floral patterns. The factory closed in 1835 with the advent of industrial weaving machines. The name survives as a generic term for all machine-made carpets with pile similar to velvet or chenille.

Axum See Aksum

ayatollah V.I-o-'to-loV In the Shiite branch of Islam, a high-ranking religious authority regarded by his followers as the most learned person of his age. The ayatollah’s authority rests on the infallible imam. His legal decisions are accepted as binding by his personal followers and (in the present day) by the wider community.

Ayckbourn Vak-.bonA, Sir Alan (b. April 12, 1939, London, Eng.) British playwright. He began acting with the Stephen Joseph Co. in Scarborough, Yorkshire, where he also wrote his earliest plays under the pseudonym Roland Allen (1959-61). Most of his plays premiered at the company’s theatre, where he was artistic director beginning in 1970. He has written over 50 plays, mostly farces and comedies that deal with marital and class conflicts, including Relatively Speaking (1967), Absurd Person Singular (1972), the trilogy The Norman Conquests (1973), Intimate Exchanges (1982), and Communicating Doors (1995).

Aydid \l-'ded\, Muhammad Farah orig. Muhammad Farah Hassan (b. c. 1930, Beledweyne, Italian Somaliland — d. Aug. 1, 1996, Mogadishu, Somalia) Somali faction leader. He received military training in Italy and the U.S.S.R. and served in posts under Mohamed Siad Barre (1978-89) before overthrowing him in 1991. He became the dominant clan leader at the centre of the Somalian civil war. Losing the interim presidency to another factional leader, Aydid continued warring on rival clans. When UN and U.S. troops arrived in Somalia (1992), Aydid

ambushed a UN contingent and was declared an outlaw. The attempt to capture him led to many deaths, and foreign troops were withdrawn. He then intensified his campaign against his rivals, but he reportedly died of a heart attack after being wounded in battle.

Ayer \'a(o)r, 'e(9)r\, Sir A(lfred) J(ules) (b. Oct. 29, 1910, London, Eng. — d. June 27, 1989, London) British philosopher. He taught at University College London (1946-59) and later at Oxford (1959-78). He gained international notice in 1936 with the publication of his first book, Language, Truth and Logic, a manifesto of logical positivism that drew on the ideas of the Vienna Circle and the tradition of British empiricism as represented by David Hume and Bertrand Russell. He is also remembered for his contributions to epistemology and his writings on the history of Anglo-American philosophy (see also analytic philosophy). His other works include The Foundations of Empirical Knowledge (1940), The Problem of Knowledge (1956), The Origins of Pragmatism (1968), Russell and Moore (1971), The Central Questions of Philosophy (1973), and Wittgenstein (1985).

Ayers \'arz\ Rock Rock outcrop, southwestern Northern Territory, Australia. Called Uluru by the Australian Aborigines and located in Uluru-Kata Tjuta National Park, it is 1,100 ft (335 m) high and may be the world’s largest monolith. Its arkosic sandstone changes colour according to the height of the sun. Shallow caves at the base of the rock are sacred to several Aboriginal tribes and contain carvings and paintings. In 1985 ownership of Ayers Rock was officially returned to the Aborigines.

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Aying or A Ying \'a-'yiq\ orig. Qian Xingcun (b. Feb. 6, 1900 — d. June 17, 1977) Chinese critic and historian of modem Chinese literature. A member of the Communist Party and of the standing committee of the League of Left-Wing Writers, he began c. 1930 to gather and study materials on the literature of modern times and of the Ming and Qing dynasties. His published works, including Women Writers in Modern China (1933) and Two Talks on the Novel (1958), contributed greatly to the record of modern culture in China.

Aylesbury Valz-b3-re\ Town (pop., 1995 est.: 61,000), south-central England. The county seat of Buckinghamshire, it lies northwest of London in the Thames valley known as the Vale of Aylesbury, noted for its rich clay. Once an important market town, it is now an industrial centre. Its historic buildings include an 18th-century county hall and a 15th-century inn.

Aymara \,I-m3- , ra\ Large South American Indian group living on the Titicaca plateau of the central Andes Mountains in present-day Peru and Bolivia. The Aymara were conquered by the Inca and the Spanish, though they rebelled against both. Traditional Aymara now live in an area of poor soil and harsh climate, where they herd llamas and alpacas, grow crops, and fish using boats made of large reeds. Poverty rates within the group are among the highest in the hemisphere.

Ayme Ve-'maV Marcel (b. March 29, 1902, Joigny, Fr. — d. Oct. 14, 1967, Paris) French novelist, essayist, and playwright. His novels include The Hollow Field (1929), The Fable and the Flesh (1943), and The Transient Hour (1946). He delighted a vast public with witty tales of talking farm animals (reflecting his own farm upbringing), some of which were published in English as The Wonderful Farm (1951). Though his extravagant creations mingling fantasy and reality were long dismissed as minor, he was belatedly recognized as a master of light irony and storytelling.

Ayodhya \o-'yod-y3\ or Oudh Town (pop., 2001: 49,417), Uttar Pradesh state, northern India. Lying on the banks of the Ghaghara River just east of Faizabad, of which it is now a suburb, Ayodhya in ancient times was one of India's greatest cities; today, it is one of the seven holy cities of Hinduism. It was the capital of Kosala, as described in the Ramayana. It became an important Buddhist centre in Buddhism's early years (6th-4th century bc), and the Buddha is said to have lived there. In the 16th century the Mughal emperor Babur built a mosque on a site traditionally associated with an ancient Hindu temple marking the birthplace of the god Rama. The storming of the mosque by Hindus in 1990, amid religious tensions, was followed by riots, and the ensuing crisis brought down the government. In 1992 the mosque was demolished by Hindu fundamentalists, and hundreds of people died in the rioting that subsequently swept through India.

Ayrshire \'er-,shir\ Breed of hardy dairy cattle (see dairy farming) that originated in the county of Ayr, Scotland, in the late 18th century. It is considered the only special dairy breed to have originated in the British Isles. Its body colour varies from almost pure white to nearly all cherry red or brown. Exported widely to other countries, it is especially common in Great Britain, the U.S., and Canada.

Ayub Khan \a-'ub-'kan\, Mohammad (b. May 14, 1907, Hazara, India — d. April 19, 1974, near Islamabad, Pak.) President of Pakistan (1958-69). After studies at Aligarh Muslim University and at the British Royal Military College, he became an officer in the Indian army (1928). He fought in Burma (Myanmar) in World War II, and afterward he rose through the ranks in the military in newly independent Pakistan. In 1958 Pakistan's Pres. Iskander Mirza abrogated the country's constitution, and Ayub became chief martial-law administrator. He declared himself president the same year, exiling Mirza. He established close ties with China and in 1965 went to war with India over control of the Kashmir region. The failure to take Kashmir, combined with unrest over suffrage restrictions, led to riots, and Ayub resigned in 1969.

Ayurveda Va-yor-.va-doV or Ayurvedic medicine Traditional system of Indian medicine. It is attributed to Dhanvantari, the physician to the gods in Hindu mythology, who received it from Brahma. Its earliest concepts were set out in the portion of the Vedas known as the Atharvaveda (c. 2nd millennium bc). The most important Ayurvedic texts are the Caraka samhita and Susruta samhita (1st— 4th century ad). These texts analyze the human body in terms of earth, water, fire, air, and ether as well as the three bodily humours (wind, bile, and phlegm). To prevent illness, Ayurvedic medicine emphasizes hygiene, exercise, herbal preparations, and yoga. To cure ailments, it relies on herbal medicines, physiotherapy, and diet. Ayurvedic medicine is still a popular form of health

care in India, where it is taught in roughly 100 colleges, and it has gained currency in the West as a form of alternative medicine.

Ayutthaya \,a-yu-'tI-3\ in full Phra Nakhon Si Ayutthaya. Town (pop., 2000 prelim.: 75,898), former capital city of the Thai kingdom of Ayutthaya. It is located northeast of present-day Bangkok. Modern-day Thailand (then called Siam) is said to date from its founding (between 1347 and 1351). The kingdom of Ayutthaya was once one of the most powerful in Southeast Asia, and its capital city flourished for more than 400 years. Much of the ancient city's architecture, art, and literature was destroyed in 1767 when it was sacked by Hsinbyushin of the Alaungpaya dynasty. The modern town of Ayutthaya is set among the ruins of the ancient city. There is some manufacturing, and tourism is important. The area was designated a UNESCO World Heritage site in 1991.

Ayyubid \a-'yu-bid\ dynasty (1173-1250) Kurdish dynasty founded by Saladin that ruled over Egypt, most of Syria, upper Iraq, and Yemen. After overthrowing the Fajimid dynasty, Saladin defended Palestine during the Crusades and made Egypt the most powerful Muslim state in the world. After Saladin' s death the Ayyubid regime became decentralized. In 1250 a group of mamluks (military slaves) exploited a lapse in Ayyubid succession to take over the government in Egypt and to found the MamlOk dynasty. Minor Ayyubid princes continued to rule in parts of the Syria for some years afterward.

azalea Any plant of certain species of the genus Rhododendron (heath family), formerly given the generic name Azalea. Though some gardeners consider azaleas distinct from rhododendrons, distinguishing characteristics of the two groups are not consistent enough to separate them into two genera. Azaleas typically are deciduous (see deciduous tree), with flowers that are funnel-shaped, somewhat two-lipped, and often fragrant. Cultivated varieties have been bred from species native to the hilly regions of Asia and North America. Well-known North American kinds include the smooth, or sweet, azalea (R . arborescensf, the flame azalea (R. calendulaceum); and the pinxter flower (R. periclymenoides).

Azall \a-za-'le\ Any member of the Bab! movement who remained faithful to the teachings of the Bab and his chosen successor, Mirza Yahya, known as Sobh-e Azal, after the movement split in 1863. For 13 years after the Bab's execution, followers recognized Sobh-e Azal as their leader. Then Sobh-e Azal's half-brother, Baha' Ullah, privately declared himself to be the prophet whose coming the Bab had foretold. The Azalls rejected him, but most Babis followed him, establishing the Baha'i faith in 1867. Now located almost exclusively in Iran, the Azalls probably number no more than a few thousand.

Azana \3-'than-yo\ (y Diaz), Manuel (b. Jan. 10, 1880, Alcala de Henares, Spain — <1. Nov. 4, 1940, Montauban, France) Spanish prime minister and president. As prime minister from 1931 to 1933, he attempted to fashion a moderately liberal government. Elected president in May 1936, he was able to accomplish little before the Spanish Civil War broke out in July. He lost control of policy and remained in office as only a figurehead until 1939, when he went into exile following the victory of the Nationalist forces of Francisco Franco.

Azande See Zande

Azerbaijan \,a-z3r-bl-'jan\ officially Republic of Azerbaijan

Country, Transcaucasia, western Asia. Area: 33,400 sq mi (86,600 sq km). Population (2005 est.): 8,381,000. Capital: Baku. Most residents are of Turkic origin, dating from the 11th century ad. Later migrations during the SeuGq period brought further groups, including some speaking Persian; Russians are a decreasing minority. Languages: Azerbaijanian (official), Russian. Religion: Islam (mostly Shl'ite). Currency: manat. Azerbaijan is characterized by a variety of landscapes. More than two-fifths of its territory is lowlands, while areas above 5,000 ft (1,500 m) occupy some one-tenth of the total area. The central part of the country is a plain through which flows the Kura River and its tributaries, including the Aras, whose upper course forms part of the boundary with Iran. The Caspian Sea serves Baku as a trade outlet. Agriculture, petroleum refining, and light manufacturing are economically important. Azerbaijan is a republic with one legislative body; its head of state and government is the president, assisted by the prime minister. Azerbaijan adjoins the Iranian region of the same name, and the origin of their respective inhabitants is the same. By the 9th century ad it had come under Turkish influence, and in ensuing centuries it was fought over by Arabs, Mongols,

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RUSSIA

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AZERBAIJAN

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Turks, and Iranians. Russia acquired what is now independent Azerbaijan in the early 19th century. After the Russian Revolution of 1917, Azerbaijan declared its independence; it was subdued by the Red Army in 1920 and was incorporated into the Soviet Union. It declared independence from the collapsing Soviet Union in 1991. Azerbaijan has two geographic peculiarities. The exclave Naxgivan (Nakhichevan) is separated from the rest of Azerbaijan by Armenian territory. Nagorno-Karabakh, which lies within Azerbaijan and is administered by it, has a Christian Armenian majority. Azerbaijan and Armenia went to war over both territories in the 1990s, causing many deaths and great economic disruption. Though attempts at mediation were made, the political situation remained

unresolved.

Azhar \'az-,har\ University, al- Chief school of Islamic and Arabic learning in the world, centred on the al-Azhar Mosque in the medieval quarter of Cairo. It was founded by the Fatimid dynasty in 970. The basic program has always focused on Islamic law, theology, and the Arabic language. Philosophy and medical studies were added during the Middle Ages but were eventually dropped from the curriculum. Philosophy was restored at the end of the 19th century, and social sciences were added at a branch campus in the early 1960s. Women were first admitted in 1962.

Azikiwe \9-'zik-wa\, Nnamdi (b. Nov. 16, 1904, Zungeru, Nigeria — d. May 11, 1996, Enugu) First president (1963-66) of independent Nigeria. Azikiwe' s National Council party won the important 1959 federal elections and helped stimulate Nigerian independence. In the conflict over Biafra (1967-70), Azikiwe first backed his fellow Igbo but then threw his support to the federal government. Thereafter he was a leading opponent of the ruling party.

azimuth See altitude and azimuth

azo Ya-zo\ dye Any of a large class of synthetic organic compounds, dyes containing two nitrogen atoms joined by a double bond (see bonding, covalent bond) in the form — N=N— as part of their molecular structure. More than half the dyes in commercial use are azo dyes. They are usually classed according to the fibres for which they are useful or the methods by which they are applied; direct dyes are absorbed from solution by the fibres, but others require a second solution (a mordant) or a second step before the colour is fast.

Azores \o-'zorz\ Portuguese Acores \9-'so-rish\ Archipelago (pop., 2001: 242,073), northern Atlantic Ocean, constituting an autonomous region of Portugal. Its islands are Flores, Corvo, Terceira, Sao Jorge, Pico, Faial, Graciosa, Sao Miguel, and Santa Maria; the capital is Ponta Delgada (on Sao Miguel). It covers an area of 901 sq mi (2,333 sq km). Subject to earthquakes and volcanic eruptions, the islands lie some 1,000 mi (1,600 km) west of mainland Europe. The uninhabited Azores were reputedly discovered c. 1427 by Portuguese pilot Diogo de Sevilha. Settlement began c. 1432; by the end of the 15th century, all the islands were inhabited and trade with Portugal was well established. They were subject to Spain in 1580-1640, and a famous sea battle between the British and Spanish occurred off Flores in 1591. The Portuguese installed a governor and captain general for the whole group in 1766; the islands were given limited autonomy in 1895. Important air and naval bases were set up there during World War II; in 1951 the U.S. established a NATO base on Lajes.

Azov \o-'z6f, 'a-.zoA, Sea of Inland sea in Europe between Ukraine and Russia. It is connected to the Biack Sea by Kerch Strait. About 210 mi (340 km) long and 85 mi (135 km) wide, it occupies an area of 14,500 sq mi (37,600 sq km). With a maximum depth of only about 46 ft (14 m), it is the world's shallowest sea. It is fed by the Don and Kuban rivers, and at their entrance in the Taganrog Gulf, its depth is 3 ft (1 m) or less. In the west lies the Arabat Spit, a 70-mi- (113-km-) long sandbar that separates the Sea of Azov from the Sy vash, a system of marshy inlets dividing the Crimean Peninsula from the Ukrainian mainland.

AZT in full azidothymidine also known as zidovudine Drug that has had success in delaying the development of AIDS in patients with HIV. Since its introduction in the mid 1980s, it has prolonged the lives of millions of patients. It is particularly effective in preventing transmission of HIV from infected pregnant women to their fetuses. Since it has a greater effect on the replication of viRUSes than of body cells, it has fewer side effects than most other AIDS drugs, though many patients nevertheless cannot tolerate it. Because HIV rapidly becomes resistant to any single antiretroviral drug, AZT is usually given in combination with other drugs.

Aztec NAHUATL-speaking people who in the 15th and early 16th centuries ruled a large empire in what is now central and southern Mexico. They may have originated on the northern Mexican plateau before migrating to their later location. Their migration may have been linked to the collapse of the Toltec civilization. The Aztec empire, which at its height comprised roughly five to six million people spread over some 80,000 sq mi (200,000 sq km), was made possible by their successful agricultural methods, including intensive cultivation, irrigation, and reclamation of wetlands. The Aztec state was despotic, militaristic, and sharply stratified according to class and caste. Aztec religion was syncretic, drawing especially on the beliefs of the Maya. The Aztec practiced human sacrifice, an activity that sometimes reached mass proportions. The empire came to an end when the Spanish conquistador Hernan Cortes took the emperor Montezuma II prisoner and conquered the great city Tenochtitlan (modern Mexico City). See also Nahua.

Aztec Ruins National Monument Archaeological site, northwestern New Mexico, U.S. Located on the Animas River just north of the town of Aztec, it was established in 1923 and has an area of 0.5 sq mi (1.3 sq km). Mistakenly named by early settlers, the site actually contains the excavated ruins of a 12th-century Pueblo town. It was designated a World Heritage site in 1987.

azulejo \,a-zu-'la-ho\ Spanish and Portuguese glazed, polychromed tile produced from the 14th century.

Introduced into Spain by the Arabs during the Moorish occupation, azulejos were used in Islamic architecture for facing walls and paving floors. Early designs were geometric and 5-6 in. (13-15 cm) square. In the 15 th— 16th centuries Portugal imported the tiles from Spain for use in religious and private buildings.

The Portuguese exported them in the 17th century to the Azores, Madeira, and Brazil, and the Spaniards introduced them to their American colonies. In the 18th century, interiors and exteriors in Puebla, Mex., were covered with azulejos in brilliant colours on a scale unequaled elsewhere.

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Azulejos from Seville, late 1 6th century; in the Museum Boymans-van Beuningen, Rotterdam

BY COURTESY OF MUSEUM BOYMANS-VAN BEUNINGEN, ROTTERDAM

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B-17 or Flying Fortress U.S. heavy bomber used in World War II. Designed by the Boeing Aircraft Co. in 1934, it cruised at 35,000 ft (10,700 m) at a maximum speed of 287 mph (462 kph). It was called the Flying Fortress because of the .50-caliber machine guns, 13 in all, at every comer. It could carry 3 tons (2.7 metric tons) of bombs in its bays and more on racks under its wings. More than 12,000 B-17s were produced during World War II, and most were used for high-level bombing over Europe.

B-52 or Stratofortress U.S. long-range heavy bomber, designed in 1948 by the Boeing Company and first flown in 1952. Originally intended as an atomic-bomb carrier capable of reaching the Soviet Union, it has proved highly adaptable and has remained in service as a conventional bomber, cruise-missile carrier, and maritime reconnaissance platform. It has a wingspan of 185 ft (56 m) and a length of more than 160 ft (49 m).

Powered by eight jet engines, its maximum speed at 55,000 ft (17,000 m) is 595 mph (960 kph).

B cell One of the two types of lymphocytes (the others being T cells). All lymphocytes begin their development in the bone marrow. B cells are involved in so-called humoral immunity; on encountering a foreign substance (antigen), the B lymphocyte differentiates into a plasma cell, which secretes immunoglobulin (see antibody).

Baader-Meinhof Gang Vba-dor-'min-.hofX or Red Army Faction West German leftist terrorist group formed in 1968 and popularly named after two of its early leaders, Andreas Baader (1943-1977) and Ulrike Meinhof (1934-1976). The members initially supported themselves by bank robberies and engaged in terrorist bombings and arson, especially of West German and U.S. targets in West Germany. Baader, Meinhof, and 18 others were arrested in 1972;

Meinhof eventually hanged herself, and Baader apparently also died a suicide. By the mid-1970s the group had turned to international terrorism; two members took part in the 1976 Palestinian airplane hijacking in the Entebbe incident. After the collapse of communism in East Germany (1989–90), it was discovered that East Germany's secret police had provided training and supplies to the gang. The group announced an end to its terrorist campaign in 1992.

Baal \'bal\ God worshiped in many ancient Middle Eastern communities, especially among Canaanites, for whom he was a fertility deity. In the mythology of Canaan, he was locked in combat with Mot, the god of death and sterility; depending on the outcome of their struggles, seven-year cycles of fertility or famine would ensue. Baal was also king of gods, having seized the kingship from the sea god, Yamm. Baal worship was popular in Egypt from the later New Kingdom to its end (1400-1075 bc). The Aramaeans used the Babylonian pronunciation Bel; Bel became the Greek Belos, identified with Zeus. The Old Testament often refers to a specific local Baal or multiple Baalim.

ba'al shem \bal-'sham\ In Judaism, a title bestowed on men who worked wonders and cures through secret knowledge of the names of God. The practice dates to the 11th century, long before the term was applied to certain rabbis and Kabbalists. They were numerous in 17th- and 18th-century eastern Europe, where they exorcised demons, inscribed amulets, and performed cures using herbs, folk remedies, and the Tetragrammaton. Because they combined faith healing with use of the Kabbala, they clashed with physicians, rabbis, and followers of the Haskala. See also Ba'al Shem Tov.

Ba'al Shem Tov Vbal-'shem-'tovV orig. Israel ben Eliezer (b. c.

1700, probably Tluste, Podolia, Pol. – d. 1760, Medzhibozh) Charismatic founder of Hasidism (c. 1750). An orphan, he worked in synagogues and yeshivas, and when he retired to the Carpathian Mountains to engage in mystical speculation he gained a reputation as a ba'al shem, or healer. From c. 1736 he lived in the village of Medzhibozh and devoted himself to spiritual pursuits. He was widely known as the Besht, an acronym of Ba'al Shem Tov. He rejected the asceticism of older rabbis and focused on communion with God, service of God in everyday tasks, and rescue of the sparks of divinity that, according to the Kabbala, are trapped in the material world. His discourses during Sabbath meals have been preserved; he left no writings of his own. He made a point of conversing with simple

working people. Hasidism brought about a social and religious upheaval in Judaism, establishing a mode of worship marked by new rituals and religious ecstasy.

Baalbeck Vba-ol-.bek, 'bal-,bek\ or Baalbek Arabic Ba'labakk
Large archaeological complex, eastern Lebanon. In ancient times it was a great city built on the lower western slope of the Anti- Lebanon Mountains. Its identification with the worship of Baal, a Semitic sun-god, gave rise to its Greek name, Heliopolis. It was made a Roman colony by the emperor Augustus Caesar. In ad 637 it came under Arab control and was administered by Muslim rulers from Syria until the 20th century. After World War I (1914-18) the French mandatory authorities made it part of Lebanon. The area in and around the city is noted for its extensive ruins, including temples of Jupiter, Bacchus, and

Venus, town walls, Roman mosaics, a mosque, and Arab fortifications. The complex was designated a UNESCO World Heritage site in 1984. The modern town (pop. 2002 est.: 29,200) is a regional urban centre.

Baath Party See Ba'th Party

Bab Vbab\, the orig. MIrza ‘All Muhammad of Shiraz (b. Oct. 20, 1819, or Oct. 8, 1820, Shiraz, Iran — d. July 9, 1850, Tabriz) Iranian religious leader who founded the BabI religion and was one of the central figures of BahaT The son of a merchant, he was influenced by the ShaykhI school of ShTite Islam. In 1 844 he wrote a commentary on the surah of Joseph in the Qur’an and declared himself the Bab (Arabic: “Gateway”) to the hidden imam. Later he would claim to be the imam himself, and finally a divine manifestation. The same year he assembled 18 disciples, who spread the new faith in the various Persian provinces. He had popular support but was opposed by members of the religious class, and he was arrested near Tehran in 1847 and imprisoned. Meeting at Badasht in 1848, his followers, the AzalT, formally broke with Islam. The Bab was executed by a firing squad at Tabriz in 1850.

Bab el -Mandeb See Mandeb, Strait of

Babbage Vbab-ij\, Charles (b. Dec. 26, 1791, London, Eng. — d. Oct. 18, 1871, London) British mathematician and inventor. Educated at Cambridge University, he devoted himself from about 1812 to devising machines capable of calculating mathematical tables. His first small calculator could perform certain computations to eight decimals. In 1823 he obtained government support for the design of a projected machine with a 20-decimal capacity.

In the 1830s he developed plans for the so-called Analytical Engine, capable of performing any arithmetical operation on the basis of instructions from punched cards, a memory unit in which to store numbers, sequential control, and most of the other basic elements of the present-day computer. The forerunner of the modern digital computer, the Analytical Engine was never completed. In 1991 British scientists built Difference Engine No. 2 (accurate to 31 digits) to Babbage’s specifications. His other contributions included establishing the modem postal system in England, compiling the first reliable actuarial tables, and inventing the locomotive cowcatcher.

Babbitt, Milton (Byron) (b. May 10, 1916, Philadelphia, Pa., U.S.) U.S. composer. At Princeton University he studied with composer Roger

Sessions and later joined the faculty. He became one of the first U.S. 12-tone composers, and he was (with his Three Compositions for Piano, 1947) perhaps the first composer to write totally serialized music based on ordered structures not only of pitch but of elements such as rhythm and dynamics. The first composer to work with RCA's Mark II synthesizer, he

Charles Babbage, detail of an oil painting by Samuel Lawrence, 1 845; in the National Portrait Gallery, London.

COURTESY OF THE NATIONAL PORTRAIT GALLERY, LONDON

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became one of the first Americans to write electronically synthesized music. He wrote various pieces combining live performers and tape.

Babel \'ba-b y il\, Isaak (Emmanuilovich) (b. July 13, 1894, Odessa, Ukraine, Russian Empire— d. March 17, 1941, Siberia, Russia, U.S.S.R.) Russian short-story writer. Born Jewish in Ukraine, Babel grew up in an atmosphere of persecution that is reflected in his stories. Maksim Gorky encouraged him to travel abroad to expand his horizons. Out of his experience as a soldier in the war with Poland came the stories in Red Cavalry (1926). His Odessa Tales (1931) include realistic and humorous sketches of the Jewish ghetto outside Odessa. Initially well regarded in the Soviet Union, in the late 1930s Babel's writing was found incompatible with official literary doctrine. He was arrested in 1939 and died in a Siberian prison camp. He is one of Russia's greatest writers of short stories.

Babel Vba-bol, 'ba-boA, Tower of In the Hebrew scriptures, a high tower built in Shinar (Babylonia). According to Genesis 11:1-9, the Babylonians wanted to build a tower "with its top in the heavens." Angry at their presumption, God disrupted the enterprise by confusing the languages of the workers so that they could no longer understand each other. The tower was left unfinished and the people dispersed over the face of the earth. The myth may have been inspired by a tower temple located north of the Marduk temple and known as Bab-ilu ("Gate of God").

"The Tower of Babel," oil painting by Pieter Bruegel the Elder, 1 563; in the Kunsthistorisches Museum, Vienna

COURTESY OF THE KUNSTHISTORISCHES MUSEUM, VIENNA

Babenberg \ l ba-bon- I berk\, House of Austrian ruling house in the 10th— 1 3th century. Leopold I of Babenberg became margrave of Austria in 976. The Babenbergs' power was modest until the 12th century, when they came to dominate the Austrian nobility. With the death of Duke Frederick II in 1246, the male line ended, and the family's power declined rapidly.

Babeuf \ba-'b3f\, Francois-Noel (b. Nov. 23, 1760, Saint-Quentin, France — d. May 27, 1797,

Vendome) French political journalist and agitator. During the era of the French Revolution he advocated an equal distribution of land and income. For his part in a conspiracy to overthrow the Directory and institute a return to the Constitution of 1793, he was guillotined. His tactical strategies provided a model for left-wing movements of the 19th and 20th centuries.

Babington, Anthony (b. October 1561, Dethick, Derbyshire,

Eng. — d. Sept. 20, 1586, London)

English conspirator. Raised secretly as a Catholic, Babington was joined by the priest John Ballard in the

unsuccessful "Babington Plot" to assassinate Queen Elizabeth I and install her prisoner, Mary, Queen of Scots, on the English throne. The conspiracy included many Roman Catholics, and Philip II of Spain promised to provide immediate assistance after the assassination. Babington was imprisoned and executed after the interception of an exchange of letters with Mary explaining his plans. The letters were also used as evidence supporting the execution of Mary the following year.

Babism Vbab-.iz-omX Religion that developed in Iran around Mlrza C A1I Muhammad's claim (1844) to be the Bab. Its beliefs are set forth in the Bay an, a holy book written by the Bab, which proclaims a universal law in place of all existing religious legal codes. Babism originated as a messianic movement in Shi'ite Islam. In 1867 the movement split, with the AzalTs remaining faithful to the original teachings of the Bab and those of his successor Sobh-e Azal. Most Babls accepted the leadership of Sobh-e Azal's half-brother Baha 5 Ullah, and under him the BahaI faith was developed.

baboon Any of five species of robust monkeys (genus Papio) of Arabia and sub-Saharan Africa. Baboons have a large head, cheek pouches, and a long, doglike muzzle. They

walk on all fours, carrying the tail in a characteristic arch. They weigh 30-90 lbs (14-40 kg) and are about 20^15 in. (50-115 cm) long, excluding the tail (18-28 in., or 45-70 cm, long). Found mainly in drier savanna and rocky areas, they feed on a variety of plants and animals. Highly social and intelligent, they travel in large noisy troops, communicating by calls. They may destroy crops, and their enormous canine teeth and powerful limbs make them dangerous opponents.

Babur Vba-borV orig. ZahTr al-DTn Muhammad (b. Feb. 15, 1483, principality of Fergana — d. Dec. 26, 1530, Agra, India) Emperor (1526—30) and founder of the Mughal dynasty of India. A descendant of Genghis Khan and Timur, he came from a tribe of Mongol origin but was Turkish in language and upbringing. In his youth he tried for 10 years (1494-1504) to gain control of Samarkand, Timur's old capital. Those efforts ended in his losing his own principality in Fergana (modem Uzbekistan), but he consoled himself by seizing and holding Kabul (1504). After four failed attempts, he successfully occupied Delhi (1525). Surrounded by enemy states, Babur (the name means "Tiger") persuaded his homesick troops to stand their ground, and over the next four years he defeated his foes. His grandson Akbar consolidated the new empire. Babur was also a gifted poet and a lover of nature who constructed gardens wherever he went. The Babur-nameh, his prose memoirs, has become a world classic of autobiography.

Babuyan \,ba-bu-'yan\ Islands Island group, northern Philippines. Lying north of Luzon, it consists of about 24 islands with a total area of 225 sq mi (583 sq km). The chief islands are Babuyan, Camiguin, Calayan, Fuga, and Dalupiri. Calayan is the largest town and only port.

baby boom In the U.S., increase in the birth rate between 1946 and 1964; also, the generation born in the U.S. during that period. The hardships and uncertainties of the Great Depression and World War II led many unmarried couples to delay marriage and many married couples to delay having children. The war's end, followed by a sustained period of economic prosperity (the 1950s and early 1960s), was accompanied by a surge in population. The sheer size of the baby-boom generation (some 75 million) magnified its impact on society: the growth of families led to a migration from cities to suburbs in the postwar years, prompting a building boom in housing, schools, and shopping malls. As the "boomers" reached young adulthood in the 1960s and '70s, their tastes in music and their hair and dress styles strongly influenced the national culture, and the political activism of some contributed to the unpopularity of the Vietnam War. As they aged and prospered in the 1980s and '90s, their buying habits determined the course of many consumer industries, including automobiles. The needs of baby boomers during their retirement years were expected to strain public resources.

Baby Yar \,ba-be-'yar\ Large ravine near Kiev, Ukraine, the site of a mass grave of some 100,000 people killed by German Nazi SS squads between 1941 and 1943. Most of the victims were Jews, but some were

Babeuf, engraving by an unknown artist, 1 8th century

COURTESY OF THE BIBUOTHEQUE NATIONALE, PARIS

Anubis, or olive, baboon (Papio anubis).

NORMAN MYERS/PHOTO RESEARCHERS

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communist officials and Russian prisoners of war. After the initial massacre of Jews, Baby Yar remained in use as an execution site for Soviet prisoners of war and for Roma (Gypsies) as well as for Jews. It became the symbol of the first stage of killing during the Holocaust and of the massacres by the Einsatzgruppen (German: “deployment groups”) — the mobile killing units. The site came to world attention after the 1961 publication of Yevgeny Yevtushenko’s poem Baby Yar. Though a small obelisk and memorial were erected in the 1960s and ’70s, not until 1991 was the identity of the Jewish victims recorded on the monument by the newly independent Ukrainian government.

Babylon Ancient Middle Eastern city. The city’s ruins are located about 55 mi (89 km) south of Baghdad, near the modern city of Al-Hillah, Iraq. Babylon was one of the most famous cities in antiquity. Probably first settled in the 3rd millennium bc, it came under the rule of the Amorite kings around 2000 bc. It became the capital of Babylonia and was the chief commercial city of the Tigris and Euphrates river system. Destroyed by Sennacherib in 689 bc, it was later rebuilt. It attained its greatest glory as capital of the Neo-Babylonian empire under Nebuchadrezzar II (r. 605-c. 561 bc). Alexander the Great, who took the city in 331 bc, died there. Evidence of its topography comes from excavations, cuneiform texts, and descriptions by the Greek historian Herodotus. Most of the ruins are from the city built by Nebuchadrezzar. The largest city in the world at the time, it contained many temples, including the great temple of Marduk with its associated ziggurat, which was apparently the basis for the story of the Tower of Babel. The Hanging Gardens, a simulated hill of vegetation-clad terracing, was one of the Seven Wonders of the World.

Babylonia Ancient cultural region of the Tigris and Euphrates river system. The area was divided into Sumer (southeast) and Akkad (northwest) when the first Babylonian line of Amorite kings took power after 2000 bc. Largely because of the efforts of Hammurabi (r. c. 1792-50 bc), Babylonia gained regional hegemony but declined after his death; the Kassites from the east eventually assumed power (c. 1595) and established a dynasty that lasted some four centuries. After Elam conquered Babylonia

(c. 1157 bc), a series of wars established a new Babylonian dynasty whose outstanding member was Nebuchadrezzar I (r. c. 1124-1103 bc). Following his rule, a three-way struggle developed for control of Babylonia among Assyria, Aram (see Aramaeans), and Chaldea, in which the Assyrians ruled the area most frequently (9th-7th century bc). In the 7th-6th centuries bc the Chaldean Nebuchadrezzar II (605-562 bc) instituted the last and greatest period of Babylonian supremacy, conquering Syria and Palestine and rebuilding Babylon, the capital city. It was conquered in 539 bc by the Persian Achaemenian dynasty under Cyrus II and in 331 bc by Alexander the Great, after which the capital city was gradually abandoned.

Babylonian Exile or Babylonian Captivity Forced detention of Jews in Babylonia following Babylonian conquest of Judah in 598/597 and 587/586 bc. The first deportation may have occurred after King Jehoiachin was deposed in 597 bc or after Nebuchadrezzar destroyed Jerusalem in 586. In 538 bc the Persian Cyrus II conquered Babylonia and allowed the Jews to return to Palestine. Some Jews chose to remain in Babylonia, initiating the Jewish Diaspora. During the Babylonian Exile the Jews maintained their national spirit and religious identity despite cultural pressures in a foreign land, with Ezekiel and other prophets keeping hope alive. Petrarch and other writers designated the Avignon papacy as the Babylonian Captivity in the 14th century, and Martin Luther used the term in the title of one of his works attacking the papacy and the Roman Catholic church in the 16th century.

baby's breath Either of two species of herbaceous plants of the genus Gypsophila (pink family), having profuse small blossoms. Both G. elegans, an annual, and G. paniculata, a perennial, are cultivated for their fine misty effect in rock gardens and flower borders and in floral arrangements. They are native to Eurasia.

Bacall, Lauren orig. Betty Joan Perske (b. Sept. 6, 1924, New York, N.Y., U.S.) U.S. actress. She worked as a model while seeking Broadway roles; her photograph on a magazine cover led to her casting in the film To Have and Have Not (1944) with Humphrey Bogart, whom she soon married. An instant success, she made three more films with Bogart: The Big Sleep (1946), Dark Passage (1947), and Key Largo (1948). She also appeared in such memorable films as How to Marry a Millionaire (1953) and Murder on the Orient Express (1974). On Broadway she won Tony Awards for her performances in Applause (1970), and Woman of the Year (1981).

baccarat Casino card game that resembles a simpler version of blackjack. In basic baccarat the house is the bank. In chemin de fer (a more advanced baccarat) the bank passes from player to player. In punto banco, it appears to pass from player to player but is actually held by the house. Casino play involves three or six 52-card decks shuffled together and dealt from a shoe (a box designed to hold several decks of playing cards). Counting spot-cards at face value and face-cards and 10s as 0, the bettor’s aim is to receive cards that are closer to totaling 9 than those of the banker. For the purpose of totaling these cards, 10 or more counts only as its last digit (for instance, 17 is counted as 7). The banker deals two cards to the bettor and to himself.

Baccarat glass Glassware manufactured since 1765 in Baccarat, France. The firm originally produced soda glass for windows and industrial use. In 1816 it was acquired by a Belgian manufacturer of lead crys-

tal; since then it has specialized in this type of glass, especially paperweights. Baccarat exhibited works in the important 1925 Exposition des Arts Decoratifs et Industries Modemes in Paris. Today the company produces tableware in both historical and modern designs.

Bacchanalia \,ba-k9-'nal-y3\ or Dionysia In Greco-Roman religion, any of the festivals of the wine god Bacchus (Dionysus), which probably originated as fertility rites. The most famous Greek festivals included the Greater Dionysia, with its dramatic performances; the Anthesteria; and the Lesser Dionysia, characterized by simple rites. Bacchanalia were introduced from lower Italy into Rome, where they were at first secret, open only to women, and held three times a year. They later admitted men and became as frequent as five times a month. In 186 bc their reputation as orgies led the Senate to prohibit them throughout Italy, except in special cases.

bacchantes See maenads and bacchantes
Bacchus See Dionysus

Bach, Alexander, baron von (b. Jan. 4, 1813 — d. 1893) Austrian politician noted for instituting a system of centralized control. He served as minister of the interior (1849-59); after the death of Felix, prince zu Schwarzenberg in 1852, he largely dictated policy in the regime. Bach centralized administrative authority for the Austrian Empire, but he also endorsed reactionary policies that reduced freedom of the press and abandoned public trials.

Bach, Carl Philipp Emanuel (b. March 8, 1714, Weimar, Saxe-Weimar — d. Dec. 14, 1788, Hamburg) German composer. Second son of Johann Sebastian Bach, he received a superb musical education from his father. In 1740 he became harpsichordist at the court of Frederick II the Great, where he remained for 28 years, after which he moved to Hamburg to take the city's leading musical position. He was a leader of the Empfindsamkeit ("sensitivity") movement, which emphasized rhapsodic freedom and sentiment. A founder of the Classical style, he is one of the first composers in whose works sonata form becomes clearly evident. He wrote some 200 works for harpsichord, clavichord, and piano (including dozens of sonatas),

some 50 keyboard concertos, many symphonies, and several oratorios and Passions. His Essay on the True Manner of Playing Keyboard Instruments (1753) was a highly important practical music treatise.

C.P.E. Bach, engraving by A. Stottrup

COURTESY OF HAAGS GEMENTEMUSEUM, THE HAGUE

Bach, Johann Christian (b. Sept. 5, 1735, Leipzig — d. Jan. 1, 1782, London, Eng.) German-born British composer. Youngest son of Johann Sebastian Bach, he studied with his brother Carl Philipp Emanuel Bach in Berlin before moving to Italy. In 1762 he became composer to the King's Theatre in London, where he would remain the rest of his life, becoming music teacher to the queen, and later the impresario (with Karl Friedrich Abel) of an important series of concerts (1765-81). He wrote some 50 symphonies, some 35 keyboard concertos, and much chamber music. His music, melodious and well formed but far from profound and with no

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trace of his father's influence, became an important prototype of the Classical style and influenced Wolfgang Amadeus Mozart.

Bach, Johann Sebastian (b. March 21, 1685, Eisenach, Thuringia, Ernestine Saxon Duchies — d. July 28, 1750, Leipzig) German composer. Born to a musical family, he became a superbly well-rounded musician; from 1700 he held positions as singer, violinist, and organist. His first major appointment, in 1708, was as organist at the ducal court at Weimar. This was followed by a six-year stay (1717-23) as kapellmeister at the princely court of Kothen, which was in turn followed by his appointment as cantor at the great church of St. Thomas in Leipzig, where he would remain for the rest of his life. Imbued with the northern German contrapuntal style (see counterpoint) from early childhood, he encountered the lively Italian style, especially in the works of Antonio Vivaldi, about 1710, and much of his music embodies an immensely convincing melding of the two styles. At St. Thomas he wrote more than 200 church cantatas. His orchestral works include the six Brandenburg Concertos, four orchestral suites, and many harpsichord concertos, a genre he invented. His solo keyboard works include the great didactic set The Well-Tempered Clavier (1722 and 1742), the superb Goldberg Variations (1742), the massive but unfinished Art of the Fugue (1749), numerous suites, and many organ preludes and fugues. His surviving choral works include (in addition to the sacred cantatas) more than 30 secular cantatas, two monumental Passions, and the Mass in B Minor. His works, never widely known in his lifetime, went into near-total eclipse after his death, and only in the early 19th century were they revived, to enormous acclaim. He was perhaps the most accomplished organist and harpsichordist of his time. Today Bach is regarded as the greatest composer of the Baroque era, and, by many, as the greatest composer of all time.

Bach, Wilhelm Friedemann (b. Nov. 22, 1710, Weimar, Saxe-Weimar — d. July 1, 1784, Berlin) German composer and organist. Eldest son of Johann Sebastian Bach, he was trained by his father. One of the finest organists of his time, he held important organist posts in Dresden

(1723-46) and Halle (1746-64) but thereafter lived an unsettled life and drifted into drinking and poverty. Though he was a highly gifted composer, his compositions veered confusingly between the old contrapuntal style and the new pre-Classical styles. He wrote more than 30 church cantatas, several keyboard concertos, and many solo keyboard works.

Bacharach Vbak-9-,rak\, Burt (b. May 12, 1928, Kansas City, Mo., U.S.) U.S. songwriter and pianist. He studied under Darius Milhaud, Bohuslav Martinu, and Henry Cowell. In the 1950s he wrote arrangements for Steve Lawrence and Vic Damone and later toured with Marlene Dietrich. In the late 1950s he began his long association with lyricist Hal David (b. 1921), which would produce many hits especially for singer Dionne Warwick (b. 1940), including “Walk On By,” “I Say a Little Prayer,” and “Do You Know the Way to San Jose?” He and David wrote the successful musical Promises, Promises (1968) and the score for the film Butch Cassidy and the Sundance Kid (1969, Academy Award). Bacharach collaborated with singer- songwriter Elvis Costello (b. 1954) on the album Painted from Memory (1998).

Bachchan, Amitabh (b. Oct. 11, 1942, Allahabad, India) Indian film actor. Bachchan’s first film success was Zanjeer (1973); by the end of the 1970s he was something of a cultural phenonemon in India and was regarded as the most popular star in the history of Indian films. He is often compared to such American action stars as Clint Eastwood, although Bachchan’s talents also extend to singing, dancing, and comedy. After a brief stint in politics in the mid 1980s, Bachchan gained a new generation of fans in the next decade as host of the television game show Kaun banega crorepati, the Indian version of the U.S. and U.K. hit Who Wants to Be a Millionaire?

bachelor's button or cornflower Herbaceous, hardy annual plant (Centaurea cyanus) of the composite family, having flower heads with blue, pink, or white rays. It is native to the Mediterranean region and widely cultivated in North America. A common garden plant, it often also appears as a weed.

bacillus \bo-'si-l9s\ Any of the rod-shaped, gram-positive bacteria (see gram stain) that make up the genus Bacillus, widely found in soil and water. The term is sometimes applied to all rodlike bacteria. Bacilli frequently occur in chains and can form spores under unfavourable environmental conditions. Resistant to heat, chemicals, and sunlight, these spores may remain capable of growing and developing for long periods of time. One type sometimes causes spoilage in canned foods. Another, wide-

spread bacillus contaminates laboratory cultures and is often found on human skin. Most strains do not cause disease in humans, infecting them only incidentally in their role as soil organisms; a notable exception is B. anthracis, which causes anthrax. Some bacilli produce antibiotics.

backbone See vertebral column

backgammon Two-person game played by moving counters (called stones) on a board or table, the movement of the counters being controlled by the throw of two dice. The board has four sections (called tables), each marked with six narrow wedges (points) in two alternating colors. Representing the two opposing sides are 15 white and 15 black stones. Stones are moved from point to point in opposite directions according to the

number of points shown on the dice. On getting all 15 of his stones into his own home (inner) table, a player may begin “bearing off” — moving his stones to an imaginary point beyond the edge of the board. The player who first bears off all 15 stones wins the game. Backgammon is one of the most ancient board games, dating from 3000 bc.

backpacking Sport of hiking while carrying clothing, food, and camping equipment in a pack on the back. In the early 20th century backpacking was primarily a means of getting to wilderness areas inaccessible by car or by day hike. It subsequently became associated with general touring by foot in urban as well as wilderness settings. Types of packs range from the frameless rucksack to the contour frame pack, with a frame of aluminum tubing and often a waistband that transfers most of the pack’s weight to the hips.

Backus, John W(arner) (b. Dec. 3, 1924, Philadelphia, Pa., U.S.) U.S. mathematician. He received his bachelor’s and master’s degrees from Columbia University. He was head of a small group that in 1957 developed the computer language FORTRAN for numerical analysis. He contributed to the development of ALGOL and developed a notation known as the Backus Normal, or Backus-Naur, Form for defining the syntax of a programmable language (1959). He received the Turing Award in 1977.

Bacolod ybo-'ko-.lodV City (pop., 2000: 429,076), south-central Philippines. It lies on the Guimaras Strait in the north of the island of Negros, opposite Guimaras Island. It is regarded as the Philippine sugar capital. Its port, to the south, is important for fishing.

Bacon, Francis (b. Oct. 28, 1909, Dublin, Ire. — d. April 28, 1992, Madrid, Spain) Irish-British painter. He lived in Berlin and Paris before settling in London (1929) to begin a career as an interior decorator. With no formal art training, he started painting, drawing, and participating in gallery exhibitions, with little success. In 1944 he achieved instant notoriety with a series of controversial paintings, Three Studies for Figures at the Base of a Crucifixion. His mature style emerged completely with the series of works known as “The Screaming Popes” (1949-mid- 1950s), in which he converted Diego Velazquez’s famous Portrait of Pope Innocent X into a nightmarish icon of hysterical terror. Most of Bacon’s paintings depict isolated figures, often framed by geometric constructions, and rendered in smeared, violent colours. His imagery typically suggests anger, horror, and degradation.

Bacon, Francis, Viscount St. Albans (b. Jan. 22, 1561, London, Eng. — d. April 9, 1626, London) British statesman and philosopher, father of modem scientific method. He studied at Cambridge and at Gray’s Inn. A supporter of the Earl of Essex, Bacon turned against him when Essex was tried for treason. Under James I he rose steadily, becoming successively solicitor general (1607), attorney general (1613), and lord chancellor (1618). Convicted of accepting bribes from those being tried in his court, he was briefly imprisoned and permanently lost his public offices; he died deeply in debt. He attempted to put natural science on a firm empirical foundation in the Novum Organum (1620), which sets forth his scientific method. His elaborate classification of the sciences inspired the 18th-century French Encyclopedists (see Encyclopedie), and his empiricism inspired 19th-century British philosophers of science. His other works include The Advancement of Learning (1605), History of Henry VII (1622), and several important legal and constitutional works.

Bacon, Nathaniel (b. Jan. 2, 1647, Suffolk, Eng. — d. October 1676, Virginia Colony) British-born American colonial planter, leader of Bacon's Rebellion. He emigrated from England in 1673 and acquired land in Virginia, where he was appointed to the council of William Berkeley, the British governor. After a dispute over Indian policy, he defied Berkeley's orders and organized an expedition against the Indians in 1676. He then

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turned his forces against Berkeley, captured Jamestown, and briefly controlled most of Virginia. His death at age 29 of influenza, at the height of his power, ended the rebellion.

Bacon, Roger (b. c. 1220, Ilchester, Somerset, or Bisley, Gloucester?,

Eng. — d. 1292, Oxford) English scientist and philosopher. He was educated at Oxford and the University of Paris and joined the Franciscan order in 1247. He displayed a prodigious energy and zeal in the pursuit of experimental science; his studies eventually won him a place in popular literature as a worker of wonders.

He was the first European to describe in detail the process of making gunpowder, and he proposed flying machines and motorized ships and carriages. He therefore represents a historically precocious expression of the empirical spirit of experimental science, even though his actual practice of it seems to have been exaggerated. His philosophical thought was essentially Aristotelian, though he was critical of the methods of theologians such as Albertus AAagnus and Thomas Aquinas, arguing that a more accurate experimental knowledge of nature would be of great value in confirming the Christian faith. He also wrote on mathematics and logic. He was condemned to prison c. 1277 by his fellow Franciscans because of "suspected novelties" in his teaching.

bacteremia V.bak-te-'re-me-oN Presence of bacteria in the blood. Short-term bacteremia follows dental or surgical procedures, especially if local infection or very high-risk surgery releases bacteria from isolated sites. In some cases, prior antibiotic therapy can prevent this. It causes little problem to a healthy immune system but can be serious for those with prostheses (where infection can center) or high susceptibility to bacterial invasion. Extensive bacteremia can release toxins into the blood (septicemia), leading to shock and vascular collapse. Antibiotic-resistant bacteria

have increased the rate of severe bacteremia.

bacteria Group of microscopic, single-celled organisms that are prokaryotes. They may have spherical, rodlike, or spiral shapes. They inhabit virtually all environments, including soil, water, organic matter, and the bodies of multicellular animals. Different types are distinguished in part by the structure of their cell walls, which is determined by gram stain. Many bacteria swim by means of flagella (see flagellum). The DNA of most bacteria is found in a single circular chromosome and is distributed throughout the cytoplasm rather than contained within a membrane-enclosed nucleus. Though some bacteria can cause food poisoning and infectious diseases in humans, most are harmless and many are beneficial. They are used in various industrial processes, especially in the food industry (e.g., the production of yogurt, cheeses, and pickles). Bacteria are divided into eubacteria and archaebacteria. See also budding bacteria,

COLIFORM BACTERIA, CYANOBACTERIA, DENITRIFYING BACTERIA, NITRIFYING BACTERIA, SHEATHED BACTERIA, SULFUR BACTERIA.

bacterial diseases Diseases caused by bacteria. The most common infectious diseases, they range from minor skin infections to bubonic plague and tuberculosis. Until the mid-20th century, bacterial pneumonia was probably the leading cause of death among the elderly. Improved sanitation, vaccines, and antibiotics have all decreased the mortality rates from bacterial infections, though antibiotic-resistant strains have caused a resurgence in some illnesses. Bacteria cause disease by secreting or excreting toxins (as in botulism), by producing toxins internally, which are released when the bacteria disintegrate (as in typhoid), or by inducing sensitivity to their antigenic properties (as in tuberculosis). Other serious bacterial diseases include cholera, diphtheria, bacterial meningitis, and syphilis.

bacteriology Study of bacteria. Modem understanding of bacterial forms dates from Ferdinand Cohn’s classifications. Other researchers, such as Louis Pasteur, established the connection between bacteria and fermentation and disease. The modern methods of bacteriological technique began in the late 19th century with the use of stains and the development of methods of cultivating organisms on plates of nutrients. Important discoveries came when Pasteur succeeded in immunizing animals against two bacterial diseases, which led to the development of immunology. See also microbiology.

bacteriophage \bak-'tir-e-3-,faj\ or phage Any of a group of usually complex viRUSes that infect bacteria. Discovered in the early 20th century, bacteriophages were used to treat human bacterial diseases such as bubonic plague and cholera but were not successful; they were abandoned with the advent of antibiotics in the 1940s. The rise of drug-resistant bacteria in the 1990s focused renewed attention on the therapeutic potential of bacteriophages. Thousands of varieties exist, each of which may infect only one or a few types of bacteria. The core of a bacteriophage’s genetic material may be either DNA or RNA. On infecting a host cell, bacteriophages known as lytic or virulent phages release replicated viral particles by lysing (bursting) the host cell. Other types, known as lysogenic or temperate, integrate their nucleic acid into the host’s chromosome to be replicated during cell division. During this time they are not virulent. The viral genome may later become active, initiating production of viral particles and destruction of the host cell. A.D. Hershey and Martha Chase

used a bacteriophage in a famous 1952 experiment that supported the theory that DNA is the genetic material. Because bacteriophage genomes are small and because large quantities can be prepared in the laboratory, they are a favourite research tool of molecular biologists. Studies of phages have helped illuminate genetic recombination, nucleic acid replication, and protein synthesis.

Bactria Ancient country, Central Asia. It was situated between the Hindu Kush and the Amu Darya in parts of modern Afghanistan, Uzbekistan, and Tajikistan. Its capital was the city of Bactra. From the 6th century bc it was controlled by the Achaemenian dynasty; conquered by Alexander the Great, the area was ruled after his death (323 bc) by the Seleucid dynasty and for a time (c. 250 bc) formed an independent kingdom. It was long important as a crossroads for overland trade and as a meeting place for various religious and artistic traditions. The area ultimately came under Muslim control in the 7th century ad.

Baden \‘bad- 3 n\ Former German state, southern Germany. The name (meaning “baths”) refers to the warm mineral springs, particularly in the town of Baden-Baden, valued since Roman times. Baden first became a political unit in 1112. Split up many times, the territory was finally reunited under Charles Frederick in 1771. A centre of 19th-century liberalism, it was active in the revolutions of 1848-50. It joined the German Empire in 1871 and became part of the Weimar Republic in 1919. After World War II, Baden was incorporated into West Germany as part of Baden- Wiirttemberg state.

Baden and Rastatt, Treaties of See Treaties of Rastatt and Baden

Baden-Powell Vba-d 3 n-'p6-9l\ (of Gilwell), Robert Stephenson Smyth, 1st Baron (b. Feb. 22, 1857, London, Eng. — d. Jan. 8, 1941, Nyeri, Kenya) British army officer and founder of the Boy Scouts and Girl Guides (later Girl Scouts; see scouting). He was noted for his use of observation balloons in warfare in Africa (1884-85). In the South African War, he became a national hero in the Siege of Mafikeng. Having learned that his military textbook Ai ds to Scouting (1899) was being used to train boys in woodcraft, he wrote Scouting for Boys (1908) and that same year established the Boy Scout movement. In 1910, with his sister Agnes and his wife, Olave, he founded the Girl Guides.

badger Any of eight species of stout-bodied carnivores (family Mustelidae) that possess an anal scent gland, powerful jaws, and large, heavy claws on their forefeet. Most species are brown, black, or gray, with markings on the face or body, and are found in South Asia. Badgers dig to find food and to construct burrows and escape routes. The American badger (Taxidea taxus), the only New World species, lives in the open, dry country of western North America. Badgers feed mostly on small animals, especially rodents. Species may be 9-12 in. (23-30 cm) high and 13-32 in. (33-81 cm) long, excluding the 2- to 10-in. (5- to 23-cm) tail, and may weigh 2^18 lbs (1-22 kg). Badgers can be savage fighters.

Badlands Barren region covering some 2,000 sq mi (5,200 sq km) of southwestern South Dakota, U.S. It has an extremely rugged landscape almost devoid of vegetation. It was created by cloudbursts that cut deep gullies in poorly cemented bedrock; its extensive fossil deposits have yielded the remains of such animals as the three-toed horse, camel, saber-toothed tiger, and rhinoceros. Badlands National Park (379 sq mi [982 sq

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km]), lying mostly between the Cheyenne and White rivers, was established as a national monument in 1939 and a national park in 1978.

badminton Court or lawn game played with light long-handled rackets and a shuttlecock volleyed over a net. The game is named after the residence of Britain’s duke of Beaufort, where it supposedly originated c. 1873. Officially sanctioned badminton matches are played indoors to protect the shuttlecock from winds. Play consists entirely of hitting the shuttlecock back and forth without letting it touch the floor or ground. The best-known match is the All-England Championships. Badminton became a full-medal sport at the 1992 Olympics. The world governing body is the International Federation of Badminton in Cheltenham, Gloucestershire, Eng.

Badoglio Vbo-'dol-yoV Pietro (b. Sept. 28, 1871, Grazzano Monferrato, Italy — d. Nov. 1, 1956, Grazzano Badoglio) Italian general and politician. An army officer, he served as chief of the general staff in 1919-21 and again in 1925-28 and was made a field marshal in 1926. He governed Libya (1928-34) and commanded the Italian forces in Ethiopia (1935—36). In 1940 he resigned as chief of staff in disagreement with Benito Mussolini, and in 1943 he helped organize Mussolini’s downfall. As prime minister (1943 — 44), Badoglio extricated Italy from World War II by arranging for an armistice with the Allies.

BAE Systems British manufacturer of aircraft, missiles, avionics, naval vessels, and other aerospace and defense products. BAE Systems was formed (1999) from the merger of British Aerospace (BAe) with Marconi Electronic Systems. BAe, in turn, dates to the merger (1977, with two other firms) of British Aircraft Corporation (BAC) and Hawker Siddeley Aviation, both having been nationalized a year earlier owing to unprofitable financial situations. Through its BAe antecedents, BAE Systems carries the legacy of some 20 British aircraft firms (e.g., Bristol, Avro, Gloster, De Havilland, Supermarine), several dating to the first decades of flight. In the 1960s and early ’70s, BAC and Hawker Siddeley each produced significant aircraft. BAC built the Vickers- Armstrongs VC 10 and BAC One-Eleven jetliners and, in partnership with Aerospatiale of France, the Concorde supersonic transport. Hawker Siddeley developed the HS 121 Trident jetliner, Vulcan bomber, and Harrier vertical/short-takeoff-and-landing (V/STOL) fighter. In 1979 British Aerospace joined the Airbus Industrie jetliner-manufacturing consortium, and during the early 1980s it became privatized. In the 1990s it became a partner with firms in Germany, Italy, and Spain in the Eurofighter Typhoon program. It also joined a venture led by Lockheed Martin to develop the Joint Strike Fighter.

Baeck VbekV Leo (b. May 23, 1873, Lissa, Posen, Prussia — d. Nov. 2, 1956, London, Eng.) Prussian-Polish rabbi, spiritual leader of German Jewry during the Nazi period. After earning his Ph.D. in philosophy at the

University of Berlin, he served as a rabbi in Silesia, Diisseldorf, and Berlin, becoming the leading liberal Jewish religious thinker of his time. He synthesized Neo-Kantianism and rabbinic ethics in The Essence of Judaism (1905) and considered the Christian gospels as rabbinic literature in The Gospel as a Document of Jewish Religious History (1938). He negotiated with the Nazis to buy time for the German Jews; finally arrested, he was sent to the Theresienstadt concentration camp, where he wrote and lectured on Plato and Immanuel Kant. Liberated in 1945 on the day before he was to be executed, he settled in England.

Baedeker Vbed-o-ksrV Karl (b.

Nov. 3, 1801, Essen, Duchy of Oldenburg — d. Oct. 4, 1859,

Koblenz, Prussia) German publisher.

The son of a printer and bookseller,

Baedeker started a firm at Koblenz in 1827 that became known for its guidebooks. His aim was to give travelers the practical information necessary to enable them to dispense with paid guides. A notable feature of the books was the use of “stars” to indicate objects and views of special interest and to designate reliable hotels. By the time of his death much of Europe had been covered by his

guidebooks. Under the ownership of his sons the firm expanded to include French and English editions.

Baekeland Vba-k9-,lant,\ English Vbak-bnd\, Leo (Hendrik) (b. Nov. 14, 1863, Ghent, Belg.— d. Feb. 23, 1944, Beacon, N.Y., U.S.) Belgian-born U.S. industrial chemist. A teacher of chemistry in Belgium, he immigrated to the U.S. in 1889. He invented Velox, the first commercially successful photographic paper, which could be developed under artificial light, and sold the rights to George Eastman for $1 million in 1899. His search for a substitute for shellac led to the discovery in 1909 of a method of forming a hard thermosetting plastic, which he named Bakelite, produced from formaldehyde and phenol. His discovery helped found the modern plastics industry.

Baer \'ber\, Karl Ernst, knight von (b. Feb. 29, 1792, Piep, Est., Russian Empire — d. Nov. 28, 1876, Dorpat, Est.) Prussian-bom Estonian embryologist. Studying chick development with Christian Pander (1794-1865), Baer expanded Pander’s concept of germ layer formation to all vertebrates, thereby laying the foundation for comparative embryology. He emphasized that embryos of one species could resemble embryos (but not adults) of another and that the younger the embryo, the greater the resemblance, a concept in line with his belief that development proceeds from simple to complex, from like to different. He also discovered the mammalian ovum. His On the Development of Animals (2 vol., 1828-37)

surveyed all existing knowledge on vertebrate development and established embryology as a distinct subject of research.

baetylus or baetulus Vbe-to-bs, 'be-tyo-bsV In Greek reugion, a sacred stone or pillar. In antiquity there were numerous holy stones, most associated with a deity. The most famous example is the holy stone known as the Omphalos in the temple of Apollo at Delphi. Sometimes the stones were formed into pillars or into groups of three pillars.

Baeyer Vba-orV, (Johann Friedrich Wilhelm) Adolf von (b. Oct. 31, 1835, Berlin, Prussia — d. Aug.

20, 1917, Stamberg, near Munich,

Ger.) German research chemist. He synthesized indigo and formulated its structure, discovered the phthalein dyes, and investigated such chemical families as the polyacetylenes, oxonium salts, and uric-acid derivatives (discovering barbituric acid, parent compound of the barbiturates). He also made contributions to theoretical chemistry. He received the Nobel Prize in 1905.

Baez Vbl-ez\, Joan (Chandos)

(b. Jan. 9, 1941, Staten Island, New York, N.Y., U.S.)U.S. folksinger and activist. She moved often as a child, receiving little musical training, but she became influential in the 1960s folk-song revival. Singing in a soprano voice, usually accompanied by her own guitar arrangements, she popularized traditional songs through her performances and best-selling record albums. An active participant in the protest movements of the 1960s and ’70s, Baez made free concert appearances at civil-rights and anti- Vietnam War rallies. Her recordings include Diamonds and Rust (1975) and Gone from Danger (1997).

Baffin Bay Large inlet, Atlantic Ocean, between western Greenland and eastern Baffin Island. With an area of 266,000 sq mi (689,000 sq km), it extends 900 mi (1 ,450 km) southward from the Arctic and is connected to the Atlantic by Davis Strait. It was visited by the English captain Robert Bylot in 1615 and named for his lieutenant, William Baffin. Its climate is severe, and icebergs are dense even in August.

Baffin Island Largest island in Canada and fifth largest island in the world (183,810 sq mi [476,068 sq km]), lying between Greenland and the Canadian mainland. Located west of Baffin Bay and the Davis Strait, it is administered as part of Nunavut territory. It was probably visited by Norse explorers in the 11th century. It was sighted by Martin Frobisher during his search for a Northwest Passage (1576-78). It is uninhabited except for a few coastal settlements. The world’s northernmost mines are at Nanisvik. In 1972 Auyuittuq National Park was created on the eastern coast.

Karl Baedeker, oil painting by an

unknown artist

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Baeyer, 1 905

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Baganda See Ganda

bagasse \bo-'gas\ Fibre remaining after the extraction of the sugar-bearing juice from sugarcane. The term was once applied more generally to various waste residues from processing plant materials. Bagasse may be used as fuel in the sugarcane mill or as a source of cellulose for manufacturing animal feeds. Paper is produced from bagasse in several Latin American countries, in the Middle East, and in all sugar-producing countries that are deficient in forest resources. It is the essential ingredient for the production of pressed building board, acoustic tile, and other construction materials.

Bagehot Vbaj-otX, Walter (b. Feb. 3, 1826, Langport, Somerset, Eng. — d. March 24, 1877, Langport)

English economist, political analyst, and journalist. While working in his uncle’s bank, Bagehot wrote literary essays and economic articles that led to his involvement with The Economist. As its editor from 1860, he helped make it one of the leading business and political journals in the world. His classic The English Constitution (1867) describes how the British system of government really operates behind its facade. His other works include Physics and Politics (1872), one of the earliest attempts to apply the concept of evolution to societies, and Lombard Street (1873), a study of banking methods.

His literary essays have been con-

tinually republished.

Baggara \ba-'gar-o\ or
Baqqarah \ba-'kar-o\ Nomadic Arab people. They number about 600,000 and are probably descended from the Arabs who migrated west out of Egypt in the Middle Ages. Today they live in a region of The Sudan extending from Lake Chad east to the Nile, migrating with their cattle herds south to the river lands in the dry season and north to the grasslands during the rains. They also raise sorghum and millet. Association with the Fulani and others have given them a distinct dialect of Arabic.

Baghdad or Bagdad City (pop., 2003 est.: metro, area, 5,750,000), capital of Iraq. Located on the Tigris River, the site has been settled from ancient times. It rose to importance after being chosen in ad 762 by Caliph al-Mansur (r. 754-775) as the capital of the ‘Abbasid dynasty. Under HarOn al- Rashid it achieved its greatest glory — reflected in the many tales from The Thousand and One Nights that were set there — as one of the world’s largest and wealthiest cities. A centre of Islamic civilization, it was second only to the Byzantine capital, Constantinople (modem Istanbul), in trade and culture. The capital was moved briefly to Samarra’ in 836, after which the city was prone to bouts of political instability. It was sacked by the Mongols under Hiilegu in 1258, taken by Timur in 1401, and captured by the Persian Safavid dynasty in 1508. Under the sultan SOleyman I, the city became part of the Ottoman Empire in 1534 and remained so — save for a brief period (1623-38) when it returned to Safavid rule — until the end of World War I (1914—18). It became capital of the kingdom (1920) and then the republic (1958) of Iraq. During the 20th century the city grew greatly in size and population. It was severely damaged during the First and Second Persian Gulf wars (1990-91 and 2003, respectively), and from 2003 it was occupied by a U.S.-led coalition force.

bagpipe Wind instrument consisting of two or more single- or double-reed pipes, the reeds being vibrated by wind fed by arm pressure on a skin or cloth bag. The pipes are held in wooden sockets tied into the bag, which is inflated either by the mouth or by bellows strapped to the body. Melodies are played on the fingerholes of the melody pipe, or chanter, while the remaining pipes, or drones, sound single notes. Bagpipes existed by about ad 100. The early bag was an animal bladder or a nearly whole sheepskin or goatskin. Bagpipes have always been folk instruments, but after the 15th century some were used for court music, and others have survived as military instruments. An important related instrument is the Irish union (or uilleann) pipe.

Baguirmi or Bagirmi \ba-ger-'me\ Former sultanate, now part of southwestern Chad. Located southeast of Lake Chad, it was probably

established in the 16th century. The king ruled from the capital city of Massenya. Though the 17th century brought prosperity as a result of the slave trade, Baguirmi became a pawn in conflicts between rival empires to the east and west. It was repeatedly sacked in the 19th century and ultimately came under French control in the late 19th century.

bagworm moth Any insect of the moth family Psychidae, found worldwide, named for the baglike cases the larvae (see larva) carry with them. The bag, which ranges in size from 0.25 to 6 in. (6-150 mm), is constructed from silk and bits of leaves, twigs, and other debris. The strong-bodied male has broad, fringed wings with a wingspread averag-

ing 1 in. (25 mm). The wormlike female lacks wings. Bagworm larvae often damage trees, especially evergreens.

Bagyidaw Vbag-yi-,dau\ (d. October 1846) Seventh monarch of the Alaungpaya dynasty (r. 1819-37) of Myanmar. Bagyidaw was an ineffectual king, but his general, Maha Bandula, convinced him to pursue a policy of expansion in northeastern India. His conquest of Assam and Manipur angered the British, who launched the first of the Anglo-Burmese Wars. Bagyidaw spent the rest of his reign trying to mitigate the harsh terms of the Treaty of Yandabo (1826), which concluded that conflict.

Baha’ Ullah \ba-'ha-ul-Ta\ orig. MTrzd Hoseyn c Ali Nurl (b. Nov. 12, 1817, Tehran, Iran — d. May 29, 1872, Acre, Palestine) Iranian religious leader, founder of the Baha’i faith. A ShTite Muslim who allied himself with the Bab, he joined his half brother Mlrza Yahya (known as Sobh-e Azal) in leading the Bab! movement after the Bab’s execution. Sunnite Muslims exiled him to Baghdad, Kurdistan, and finally Constantinople, where in 1867 he declared himself the imam-mahdi foretold by the Bab and sent by God. This pronouncement split Babism into two factions, with a small group (the Azau) adhering to its original beliefs and a larger group following him into what became the Baha’i faith. The Ottoman government banished him to Acre where, as Baha’ Ullah, he developed Baha’i into a teaching that advocated the unity of all religions and universal human brotherhood.

Baha’i \ba-'ha-e\ Religion founded in Iran in the mid- 19th century by Baha’ Ullah. It emerged from Babism when in 1863 Baha’ Ullah asserted that he was the messenger of God predicted by the Bab. Before his death in 1892, he appointed his son c Abd ol-Baha to lead the community. The writings of the Bab, Baha’ Ullah, and ‘Abd ol-Baha form the sacred literature. Worship consists of readings from scriptures of all religions. Baha’i faith proclaims the essential unity of all religions and the unity of humanity. It is concerned with social ethics and has no priesthood or sacraments. Because of its 19 initial disciples, it considers the number 19 sacred, and the calendar consists of 19 months of 19 days (with four additional days). Adherents are expected to pray daily, fast 19 days a year, and keep to a strict ethical code. Baha’i has experienced major growth since the 1960s but has been persecuted in Iran since the fundamentalist revolution of 1979.

Bahamas, The officially Commonwealth of The Bahamas

Archipelago and state, northwestern edge of the West Indies, lying southeast of Florida and north of Cuba. It consists of about 700 islands and numerous cays. Area: 5,382 sq mi (13,939 sq km). Population (2005 est.): 323,000. Capital: Nassau (on New Providence Island). The people are of African and European ancestry, a legacy of the slave trade. Language: English (official). Religion: Christianity (mostly Protestant; also Roman Catholic, other Christians). Currency: Bahamian dollar. Chief among the islands, from north to south, are Grand Bahama, Abaco, Eleuthera, New Providence, Andros, Cat, and Inagua; New Providence has most of the population. All are composed of coralline limestone and lie mostly only a few feet above sea level; the highest point is Mount Alvernia (206 ft [63 m]) on Cat Island. There are no rivers. The country’s market economy is heavily dependent on tourism, for which gambling is a particular attraction, and on international financial services. Most foodstuffs are imported from the U.S.; fish and rum are significant exports. The Bahamas is a constitutional monarchy with two legislative houses; its chief of state is the

British monarch, represented by a governor-general, and the head of government is the prime minister. The islands were inhabited by Arawak Indians when Christopher Columbus sighted them on Oct. 12, 1492. Many scholars believe Columbus landed on San Salvador (Watling) Island, though others contend his first landfall was on Samana Cay (Cat Island). The Spaniards made no attempt to settle but carried out slave raids that depopulated the islands; when English settlers arrived in 1648 from Bermuda, the islands were uninhabited. They became a haunt of pirates and

Walter Bagehot, mezzotint by Norman Hirst, after a photograph.

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Port-au-Prince @

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buccaneers, and few of the ensuing settlements prospered. The islands enjoyed some prosperity following the American Revolution, when loyalists fled the U.S. and established cotton plantations there. The islands were a centre for blockade runners during the American Civil War. Not until the development of tourism after World War II did permanent economic prosperity arrive. The Bahamas was granted internal self-government in 1964 and became independent in 1973.

Bahia \ba-'e-a\ State (pop., 2003 est.: 13,435,612), eastern Brazil. It covers an area of 218,029 sq mi (564,693 sq km), and its capital is Salvador. The major river is the Sao Francisco. The Portuguese first entered the region in 1501, through the bay where Salvador is now located. Colonization began in the coastal region; the discovery of gold and gems in the Diamantina Upland attracted more settlers in the 18th century. A state since 1889, Bahia is rich in mineral resources, including petroleum, natural gas, lead, copper, chromium, and tin. Its heavy industries include petroleum refining and ironworks. It is also an important agricultural producer.

Bahia See Salvador

Bahr al-Ghazal See Ghazal River

Bahr al-Jabal See Jabal River

Bahrain \ba-'ran\ officially Kingdom of Bahrain Country, Middle East, southwestern Asia. Area: 278 sq mi (720 sq km). Population (2005 est.): 715,000. It occupies an archipelago consisting of Bahrain Island and about 30 smaller islands lying along the Arabian Peninsuia in the Persian Gulf. Saudi Arabia lies to the west across the Gulf of Bahrain, and the Qatar peninsula lies to the east. The capital is Manama. Most of the population is Arab. Language: Arabic (official). Religion: Islam (official). Currency: Bahraini dinar. Bahrain Island, which is about 30 mi (50 km) long and 10 mi (16 km) wide, accounts for seven-eighths of the country's total area and, with the islands of Al-Muharraq and Sitrah off its northeastern coast, constitutes the population and economic centre of the country. Since 1986 the main island has been connected to Saudi Arabia by a 15-mi (24-km) causeway. The highest point of elevation is Al-Dukhan Hill (440 ft [134 m]). Bahrain has a developing mixed (state and private enterprise) economy based largely on natural gas and petroleum production and refining. Bahrain is a constitutional monarchy. The chief of state is the king, and the head of government is the prime minister. The area has long been an important trading centre and is mentioned in Persian, Greek, and Roman references. It was ruled by various Arab groups from the 7th century ad but was then occupied by the Portuguese (1521-1602). Since 1783 it has been ruled by a family group known as the A1 Khallfah, though

SAUDI AL-MUHARRAQ

ARABIA ISLAND Al .

,, Al-Muharraq

Manama^ £J £ u . .

_ ® Al-Hadd

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*AI-Jasrah . t SITRAH
UMM AN- MadTnat* • A £ Rlfa '

NA'SAN Hamad Ar-Rifa ' ash-SharqT

Al-Malikiyah* *<AwalT

, A Ad-Dukhan Hill

>6° AI-WasmTyah, 440 ft.

Gulf of
Bahrain

Ad-Dur

Ar-Rumaythah #

SAUDI

ARABIA

Persian

Gulf

HAWAR

ISLANDS) \p_ V*

(BAHRAIN) 'i

QATAR

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(through a series of treaties) its defense
long remained a British responsibility
(1820-1971). After Britain withdrew its
forces from the Persian Gulf (1968), Bah-
rain declared its independence (1971). It
served as a centre for the allies in the First Persian Gulf War (1990-91).
Since 1994 it has experienced periods of political unrest, mainly among
its large Shl'ite population. Constitutional revisions, ratified in 2002, made
Bahrain a constitutional monarchy and enfranchised women; parliamen-
tary elections (the first since 1975) were held in October 2002.

Bai River See Yongding River

Baibars I See Baybars I

Baikal, Lake Russian Ozero Baykal \bl-'kal\ Lake, southern Sibe-
ria, Russia, in Asia. With a length of 395 mi (636 km) long and an area
of some 12,200 sq mi (31,500 sq km), it is the largest freshwater basin in
Eurasia. It is also the deepest continental body of water on Earth (5,315
ft [1,620 m]), containing one-fifth of the fresh water on Earth’s surface.
More than 330 rivers and streams flow into it; on its east it receives the
Barguzin and Selenga rivers, and most of its outflow is through the Angara
at the northern end. The island of Olkhon is in its centre. Plant and ani-
mal life are rich and various; at least 1,500 species are unique to the lake.
Growing industrialization along its shores has produced threatening pol-
lution. In 1996 the Lake Baikal Coastal Protection Zone was designated

a UNESCO World Heritage site.

bail Temporary release of a prisoner in exchange for security given to guarantee the prisoner’s appearance at a later hearing. It also refers to the actual security given (e.g., cash). Its main use today is to secure the freedom, pending trial, of someone arrested and charged with a criminal offense. Its use in civil (noncriminal) cases is far less common, as most do not involve imprisonment. The amount of bail is generally set in relation to the gravity of the offense, though other factors, such as the strength of the evidence, the character of the accused, and the accused’s ability to secure bail may also be considered. See also bond, recognizance.

Bailey, Pearl (Mae) (b. March 29, 1918, Newport News, Va., U.S. — d. Aug. 17, 1990, Philadelphia, Pa.) U.S. singer and entertainer. She began her career at age 15, appearing in nightclubs and theatres and with jazz bands, including the Count Basie band. Her first Broadway musical was St. Louis Woman in 1946; her first film was Variety Girl in 1947. She became known for her lively and earthy style. In 1952 she married the drummer and bandleader Louis Bellson, with whom she later often appeared. The most memorable of her Broadway roles, which included Carmen Jones (1954), was as Dolly Levi in an all-black production of Hello, Dolly! (1967-69).

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bailiff Officer of some U.S. courts whose duties include keeping order in the courtroom and guarding prisoners or jurors in deliberation. In medieval Europe, it was a title of some dignity and power, denoting a manorial superintendent or royal agent who collected fines and rent, served writs, assembled juries, made arrests, and executed the monarch’s orders. The bailiff’s authority was gradually eroded by the increasing need to use administrators with legal or other specialized training.

Bailly \ba-'ye\, Jean-Sylvain (b. Sept. 15, 1736, Paris, France — d. Nov. 12, 1793, Paris) French astronomer and politician. Noted for his computation of an orbit for Halley's Comet in 1759, he turned to politics with the outbreak of the French Revolution. He was chosen president of the Third Estate in May 1789 and was proclaimed the first mayor of Paris in July. He later lost popularity, particularly after his order to disperse a riotous crowd led to the massacre of the Champ de Mars (1791). He retired but was subsequently arrested, taken before the revolutionary tribunal, and guillotined.

Baily's beads Arc of bright spots seen during a total eclipse of the Sun, named for Francis Baily (1774-1844), the English astronomer who first called attention to them. Just before the Moon’s disk completely covers the Sun, the narrow crescent of sunlight may be broken in several places by mountains and valleys on the edge of the Moon’s disk; the resulting

spots resemble a string of beads. The “diamond-ring effect” occurs when the very last rays of the Sun to be obscured look like a bright diamond on the solar corona.

Baird, Bil and Cora (respectively b. Aug. 15, 1904, Grand Island, Neb., U.S. — d. March 18, 1987, New York, N.Y.; b. Jan. 26, 1912, New York City — d. Dec. 6, 1967, New York City) U.S. puppeteers. Bil Baird (originally William Britton Baird) worked under the puppeteer Tony Sarg for five years then produced his own puppet shows from the mid 1930s. He and Cora Eisenberg married in 1937 and began to create original puppets, scenery, and music for their shows. They produced a series of television shows in the 1950s and opened their own marionette theatre in New York in 1966. Bil wrote The Art of the Puppet (1965) and trained puppeteers such as Jim Henson.

Baird, John L(ogie) (b. Aug. 13, 1888, Helensburgh, Dunbarton, Scot. — d. June 14, 1946, Bexhill-on-Sea, Sussex, Eng.) Scottish engineer. Plagued by ill health, he gave up his job as an electric-power engineer in 1922 and devoted himself to television research. He produced televised objects in outline in 1924 and recognizable human faces in 1925, and in 1926 became the first person to televise pictures of objects in motion. He demonstrated colour television in 1928. The German post office gave him facilities to develop a television service in 1929. When the BBC television service began (1936), his system competed with that of Marconi Electric and Musical Industries; the BBC adopted the latter exclusively in 1937. Baird was reported to have completed research on stereoscopic television at the time of his death.

Bairiki Vbl-,re-ke\ Islet (pop., 2000: urban agglomeration, 36,717) and administrative centre, Kiribati. It is located on Tarawa Atoll, northern Gilbert Islands. It has port facilities as well as an extension centre of the University of the South Pacific.

Baja \'ba-,ha\ California Spanish "Lower California" Peninsula, northwestern Mexico. Bounded by the U.S. to the north, the Pacific Ocean to the west, and the Gulf of California to the east, it is about 760 mi (1,220 km) long and has an area of 55,366 sq mi (143,396 sq km). Politically, it is divided into the states of Baja California and Baja California Sur. It has more than 2,000 mi (3,200 km) of coastline, with sheltered harbours on both the western and gulf coasts. The area had been inhabited for some 9,000 years when the Spanish arrived in 1533. Jesuit missionaries established permanent settlements in the late 17th century, but the native Indians were practically exterminated in epidemics introduced by the Spanish. The area was separated from what is now the U.S. state of California by treaty in 1848 following the Mexican War.

Baja California formerly Baja California Norte State (pop., 2000: 2,487,367), northern Baja California peninsula, northwestern Mexico. It covers an area of 27,071 sq mi (70,114 sq km), and its capital is Mexicali. Although long inhabited, it remained sparsely populated until the 1950s, when it experienced phenomenal growth. This was partly because of its proximity to the U.S. border; numerous foreign companies have established assembly oriented factories (maquiladoras) in the region, a trend accelerated by the establishment of NAFTA in 1994.

Baja California Sur State (pop., 2000: 423,516), southern Baja California peninsula, northwestern Mexico. It occupies an area of 28,369 sq

mi (73, 475 sq km), and its capital is La Paz. It became a state in 1974. It is sparsely populated and remains relatively underdeveloped. Much new acreage of cotton has been planted near La Paz, but subsistence agriculture is most common. An increase in tourism and improved communications have begun to alleviate the state's isolation.

Baker, Chet orig. Chesney Henry Baker (b. Dec. 23, 1929, Yale, Okla., U.S. — d. May 13, 1988, Amsterdam, Neth.) U.S. trumpeter and singer. After playing in army bands he attracted attention during engagements with Charlie Parker and Gerry Mulligan in 1952 and 1953. His subdued tone and gentle phrasing made him the epitome of the cool jazz (see bebop) of the 1950s. With recordings such as "My Funny Valentine" he established his plaintive, fragile approach as a vocalist, which mirrored his trumpet style. Much of his later career, interrupted several times by legal problems stemming from drug addiction, was spent in Europe.

Baker, Josephine orig. Freda Josephine McDonald (b. June 3, 1906, St. Louis, Mo., U.S. — d. April 12, 1975, Paris, France) U.S.-born French entertainer. She joined a dance troupe at age 16 and soon moved to New York City, where she performed in Harlem nightclubs and on Broadway in Chocolate Dandies (1924). She went to Paris in 1925 to dance in La Revue negre. To French audiences she personified the exoticism and vitality of African American culture, and she became Paris's most popular music-hall entertainer, receiving star billing at the Foues Bergere. In World War II she worked with the Red Cross and entertained Free French troops. From 1950 she adopted numerous orphans of all nationalities as "an experiment in brotherhood." She returned periodically to the U.S. to advance the cause of civil rights.

Baker, Newton D(iehl) (b. Dec. 3, 1871, Martinsburg, W.Va., U.S. — d. Dec. 25, 1937, Cleveland, Ohio) U.S. secretary of war. He practiced law in Martinsburg from 1897. After moving to Cleveland, he was elected mayor (1912-16). He helped obtain the 1912 Democratic presidential nomination for Woodrow Wilson, who appointed him secretary of war (1916-21). Although he was a pacifist, Baker developed a plan for the military draft and oversaw the mobilization of more than four million men during World War I. In 1928 he was appointed to the International Court of Arbitration at The Hague.

Baker, Philip John Noel- See Philip Noel-Baker

Baker, Russell (Wayne) (b. Aug. 14, 1925, Loudoun county, Va., U.S.) U.S. newspaper columnist. Baker joined the Baltimore Sun in 1947. In 1954 he moved to the Washington bureau of the New York Times , and in the early 1960s he began his syndicated "Observer" column. Initially concentrating on political satire, he later found other subjects to skewer as well. In 1979 he won the Pulitzer Prize for commentary. His books include the autobiographies Growing Up (1982, Pulitzer Prize) and The Good Times (1989). In 1993 he became host of the television program

Masterpiece Theatre.

Baker, Sara Josephine (b. Nov. 15, 1873, Poughkeepsie, N.Y., U.S. — d. Feb. 22, 1945, New York, N.Y.) U.S. physician. She became the first American woman to receive a doctorate in public health. As the first director of New York City's Division of Child Hygiene (the first public agency devoted to child health), she helped make New York's infant-mortality rates the lowest of any major American city. She helped found the American Child Hygiene Association and organized what became the Children's Welfare Federation of New York. She published five books on child hygiene.

Baker v. Carr (1962) U.S. Supreme Court case that forced the Tennessee legislature to reapportion itself on the basis of population. The case ended the traditional overrepresentation of rural areas in the legislature and established that the court may intervene in apportionment cases. The court ruled that every citizen's vote should carry equal weight, regardless

Josephine Baker.

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of the voter's place of residence. Its ruling in Reynolds v. Sims (1964) built on Baker by requiring virtually every state legislature to be reapportioned, ultimately causing political power in most states to shift from rural to urban areas.

Bakersfield City (pop., 2000: city, 247,057; metro, area, 661,645), southern California, U.S. Situated on the Kern River in the San Joaquin Valley, it was founded in 1869 by Thomas Baker. It was an agricultural area when the discovery of the Kern River oil fields in 1899 sparked a petroleum boom. The city was quickly rebuilt after a major earthquake in 1952. Nearby vineyards produce about a quarter of the wine made in California.

Bakewell, Robert (b. 1725, Dishley, Leicestershire, Eng. — d. Oct. 1, 1795, Dishley) English agriculturist.

He revolutionized English sheep and cattle breeding by methodical selection, inbreeding, and culling. He was one of the first to breed sheep and cattle for meat and the first to establish on a large scale the practice of letting animals for stud. His farm

became famous as a model of scientific management.

Bakhtin \b9k-'ten\, Mikhail (Mikhailovich) (b. Nov. 17, 1895, Orel, Russia — d. March 7, 1975, Moscow, U.S.S.R.) Russian literary theorist and philosopher of language.

His works frequently offended the Soviet authorities, and in 1929 he was exiled from Vitsyebsk to Kazakhstan. He is especially known for Problems of Dostoevsky's Poetics (1929), which advanced theories that he further developed in The Dialogic Imagination (1975). His wide-ranging ideas significantly influenced Western thinking in cultural history, linguistics, literary theory, and aesthetics.

Bakhtyarl or Bakhtiyari or Bakhtiari \bak-'te-3-re\ Any member of a community of nomadic pastoral tent dwellers of western Iran. They speak a dialect of Luri (a language related to Modern Persian) and are mostly Shfite Muslims. Their two tribal groups are the Chahar Lang and Haft Lang; the position of leader of all the Bakhtyarl alternates every two years between the chiefs of the two tribal groups. Many chiefs have been influential in national public affairs and have held office. Bakhtyarl women are normally better-educated and freer than other Muslim women in Iran.

baking Process of cooking by dry heat, especially in an oven. Baked products include bread, cookies, pies, and pastries. Ingredients used in baking include flour, water, leavening agents (baker's yeast, baking soda, baking powder), shortening (fats, oils), eggs, milk, and sugars. These are mixed together to create dough or batter, which is then transferred to a pan or sheet and heated. Leavening agents produce gas that becomes trapped in the dough, causing it to rise. Shortening makes doughs more easily workable and the final product more tender. Egg whites are used to produce a light, airy texture, and yolks contribute colour, flavour, and texture. Milk is used for moistening and flavouring and sugars for sweetening and aiding fermentation.

baking soda See bicarbonate of soda

Bakke \'ba-ke\ decision formally Regents of the University of California v. Bakke (1978) Decision of the Supreme Court of the United States that ruled unconstitutional the use of fixed quotas for minority applicants at professional schools. At issue was a state medical school' s affirmative action program that, because it required a certain number of minority admissions, twice denied entrance to an otherwise qualified white candidate (Allan Bakke). Though the court outlawed quota programs on the grounds that they violated the equal-protection clause of the Constitution of the United States, it allowed colleges to use race as a factor in making college admissions decisions.

Bakongo See Kongo

Bakst Vbakst\, Leon orig. Lev Samuilovich Rosenberg (b. Jan.

27, 1866, St. Petersburg, Russia — d. Dec. 28, 1924, Paris, France) Russian painter and stage designer. He attended the Imperial Academy of Arts at St. Petersburg and studied in Paris. In 1898 he cofounded the journal Mir Iskusstva (“World of Art”) with Sergey Diaghilev. He began designing scenery for the imperial theatres in 1900. In Paris he designed sets and costumes for Diaghilev’ s new Ballets Russes. His bold designs and sumptuous colours, conveying an exotic “Orientalism,” won him international fame. His designs for a London production of Pyotr Ilyich Tchaikovsky’s Sleeping Beauty in 1921 are regarded as his greatest work.

Baku \ba-'kii\ City (pop., 2003 est.: 1,828,800), capital of Azerbaijan. Located on the western shore of the Caspian Sea at the sea’s best harbour, Baku has long been inhabited. By the 11th century ad it was in the possession of the Shirvan shahs, who made it their capital in the 12th century. In 1723 Peter I (the Great) took Baku, but it was returned to Persia in 1735; Russia recaptured it in 1806. It was the capital of the short-lived independent state of Azerbaijan (1918-20) and in 1920 became the capital of the new Soviet republic of Azerbaijan. The basis of Baku’s economy is petroleum. The city’s historic centre was designated a UNESCO World Heritage site in 2000.

bakufu \ba-'ku-fu\ Japanese "tent government" Military rule of the country by a hereditary SHOGUN, as opposed to rule by the imperial court and the emperor. There have been three periods of bakufu government in Japanese history: Minamoto Yoritomo established the Kamakura bakufu (see Kamakura period) at the end of the 12th century, Ashikaga Takauji established the Muromachi bakufu (see Muromachi period) in the early 14th century, and Tokugawa Ieyasu established the Edo bakufu (see Tokugawa period) at the beginning of the 17th century. The Edo bakufu was the most successful, a time of peace and prosperity that lasted over 250 years. See also daimyo; Hojo family; jito.

Bakunin Nbo-'kim-yonN, Mikhail (Aleksandrovich) (b. May 30,

1814, Premukhino, Russia — d. July 1, 1876, Bern, Switz.) Russian anarchist and political writer. He traveled in western Europe and was active in the Revolutions of 1 848. After attending the Slav congress in Prague, he wrote the manifesto “An Appeal to Slavs” (1848). Arrested for revolutionary intrigues in Germany (1849), he was sent to Russia and exiled to Siberia. He escaped in 1861 and returned to western Europe, where he continued his militant anarchist teachings. At the First International (1872) he engaged in a famous quarrel with Karl Marx, which split the European revolutionary movement.

Ba'labakk See Baalbek

Balaguer \,ba-la-'ger\ (y Ricardo), Joaquin (Vidella) (b. Sept. 1, 1907, Villa Bisono, Dom. Rep. — d. July 14, 2002, Santo Domingo) President of the Dominican Republic (1960-62, 1966-78, 1986-96). He held numerous government posts during Gen. Rafael Trujillo’s 30-year dictatorship. Balaguer was vice president under Trujillo’s brother Hector and became president when Hector resigned, but Trujillo continued to wield actual power until assassinated in 1961. Balaguer’s subsequent attempts at liberalization caused his overthrow by the military. Elected president in 1966 after the U.S. military intervention in 1965, he achieved steady economic growth and modest social reforms. He was reelected repeat-

edly, but his last term was shortened by two years amid political violence and charges of electoral fraud and corruption.

Balakirev \bo Ta-kyi-ryif\, Mily (Alekseyevich) (b. Jan. 2, 1837, Nizhny Novgorod, Russia — d. May 29, 1910, St. Petersburg) Russian composer. As a youth he met and was influenced by the nationalist composer Mikhail Glinka. Balakirev himself later became the mentor of Cesar Cui (1835-1918) and Modest Mussorgsky; in 1861-62 their group expanded to become The Five. In 1862 Balakirev cofounded the Free School of Music. His works include two symphonies, the piano fantasy Islamey (1869), music for King Lear (1858-61), and a piano concerto. With his colourful imagination and use of folk themes, he was perhaps the most influential proponent of Russian nationalism. After a nervous breakdown in 1 87 1 , he adopted a fervent and bigoted form of Orthodoxy and was thereafter involved in musical life only sporadically.

Balaklava Vbo-lo-'kla-voV Battle of (Oct. 25, 1854) Indecisive military engagement of the Crimean War. The Russians sought to capture the Black Sea supply port of Balaklava, which was controlled by the British, French, and Turks. The Russians occupied positions on the heights above a nearby valley. To disrupt the Russian troop movements, Baron Raglan gave an ambiguous order for Lord Cardigan’s Light Brigade to attack. Instead of leading his cavalry against the Russian guns on the heights.

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Cardigan swept down the valley after the retreating Russian cavalry. The battle ended with the loss of 40% of the Light Brigade and inspired the 1855 poem “Charge of the Light Brigade” by Alfred, Lord Tennyson.

balalaika X.ba-ls-'lI-koV Russian stringed instrument with a triangular body, three strings, and movable frets on its fingerboard. It comes in six sizes, from piccolo to double bass. It developed in the 1 8th century from the dombra. It has been primarily a solo folk instrument for accompanying song and dance, but is also played in large balalaika orchestras.

balance Instrument for comparing the weights of two bodies, usually for scientific purposes, to determine the difference in mass. The equal-arm balance dates back to the ancient Egyptians, possibly as early as 5000 bc. By the early 20th century, it had been developed into an exquisitely precise measuring device. Electronic balances today depend on electrical

compensation rather than mechanical deflection. The ultramicrobalance is any weighing device that serves to determine the weight of even smaller samples than can be weighed with the microbalance (which can weigh samples as small as a few milligrams), that is, total amounts as small as a few micrograms.

balance of payments Systematic record of all economic transactions during a given period between

residents (including the government) of one country and residents (including the governments) of other countries. The transactions are presented in the form of double-entry bookkeeping. The U.S. balance of payments, for example, records the various ways in which dollars are made available to foreigners through U.S. imports, U.S. tourist spending abroad, foreign lending, and so on. These expenditures are shown on the debit side of the balance. The credit side shows the various uses to which foreigners put their dollars, including paying for U.S. exports, servicing debts to the U.S., and the like. Foreign countries may acquire more dollars than they need to spend on U.S. goods and services and may hold the surplus or purchase gold or securities; or they may have fewer dollars than they need to purchase U.S. goods and services, and may acquire additional dollars by transferring gold, selling holdings in the U.S., and so on. Certain forms of transferring funds (e.g., large outflows of gold) are less desirable as a way of settling foreign debts than others (e.g., transfers of currency acquired through international trade). The International Monetary Fund helps address problems relating to balance of payments. See also BALANCE OF TRADE.

Russian tenor balalaika, 20th century; in the Metropolitan Museum of Art, New York City

COURTESY OF THE METROPOLITAN MUSEUM OF ART, NEW YORK CITY, THE CROSBY BROWN COLLECTION OF MUSICAL INSTRUMENTS, 1889

balance of power In international relations, an equilibrium of power sufficient to discourage or prevent one nation or party from imposing its will on or interfering with the interests of another. The term came into use at the end of the Napoleonic Wars to denote the power relationships in the European state system. Until World War I, Britain played the role of balancer in a number of shifting alliances. After World War II, a Northern Hemisphere balance of power pitted the U.S. and its allies (see NATO) against the Soviet Union and its satellites (see Warsaw Pact) in a bipolar balance of power backed by the threat of nuclear war. China’s defection from the Soviet camp to a nonaligned but covertly anti-Soviet stance produced a third node of power. With the Soviet Union’s collapse (1991), the U.S. and its NATO allies were recognized universally as the world’s paramount military power.

balance of trade Difference in value over a period of time between a nation’s imports and exports of goods and services. The balance of trade is part of a larger economic unit, the balance of payments, which includes all economic transactions between residents of one country and those of other countries. If a nation’s exports exceed its imports, the nation has a

favourable balance of trade, or a trade surplus. If imports exceed exports, an unfavourable balance of trade, or a trade deficit, exists. Under mercantilism a favourable balance of trade was an absolute necessity, but in classical economics it was more important for a nation to utilize its economic resources fully than to build a trade surplus. The idea of the undesirability of trade deficits persisted, however, and arguments against deficits are often advanced by advocates of protectionism.

balance sheet Financial statement that describes the resources under a company’s control on a specified date and indicates where they have come from. It consists of three major sections: assets (valuable rights owned by the company), liabilities (funds provided by outside lenders and other creditors), and the owners’ equity. On the balance sheet, total assets must always equal total liabilities plus total owners’ equity.

Balanchine \ba-la n -'shen\, George orig. Georgy Melitonovich Balanchivadze (b. Jan. 22, 1904,

St. Petersburg, Russia — d. April 30,

1983, New York, N.Y., U.S.)

Russian-born U.S. choreographer.

After studying at the Imperial Ballet School, he left the Soviet Union in 1925 to join the Ballets Russes, where his choreography of Apollo (1928) exemplified the spare neoclassical style that became his trademark. His work impressed the impresario Lincoln Kirstein, who in 1933 invited “Mr. B.” to form the School of American Ballet and its performing group, the American Ballet. The group became the Metropolitan Opera’s resident company (1935—

38) but disbanded in 1941. In 1946 Kirstein and Balanchine founded the Ballet Society, from which emerged the New York City Ballet in 1948. Balanchine created more than 150 works for the company, including The Nutcracker (1954), Don Quixote (1965), and Jewels (1967), and he also choreographed musicals and operas. He collaborated closely with the composer Igor Stravinsky, setting more than 30 works to his music. Balanchine’s work remains in the repertoires of many companies worldwide, and he is widely considered the greatest choreographer of the 20th century.

Balaton Vbo-lo-.tonX, Lake Lake, Hungary. Southwest of Budapest, it is the largest lake in central Europe, covering 23 1 sq mi (598 sq km), with a maximum depth of about 37 ft (11 m). It contains two wildlife reserves. While agriculture remains important in the area, the tourist industry has become significant, and resorts, including Siofok and Balatonfiired, have been developed.

Balbo, Italo (b. June 6, 1896, near Ferrara, Italy — d. June 28, 1940, Tobruk, Libya) Italian aviator and politician. He led the fascist Blackshirts in the March on Rome (1922) and served under Benito Mussolini as general of militia (1923) and air minister (1929-33). Balbo developed Italian military and commercial aviation and became famous for promoting mass international flights to demonstrate Italy's air power. He was appointed governor of Libya in 1933 and died when his plane was accidentally shot down by Italian guns over Tobruk.

Balboa, Vasco Nunez de (b. 1475, Badajoz, Extremadura province, Castile — d. Jan. 12, 1519, Acla, near Darien, Pan.) Spanish conquistador and explorer. In 1500 he explored the coast of modern Colombia, then settled in Hispaniola. Forced to flee creditors, he joined an expedition to assist a colony in Colombia. He persuaded the settlers to move across the Gulf of Uraba to Darien, where in 1511 they founded the first stable settlement on the South American continent. In 1513 he became the first European to see the Pacific Ocean and took possession of the Mar del Sur (South Sea) and adjacent lands for Spain. He became governor of the Mar del Sur and of the provinces of Panama and Coiba but remained subject to a rival, Pedro Arias Davila, or Pedrarias (14407-1531). Fearing Balboa's influence, Pedrarias had him seized and charged with rebellion, treason, and other misdeeds. After a farcical trial, Balboa was beheaded.

Balch \'bolch\, Emily Greene (b. Jan. 8, 1867, Jamaica Plain, Mass., U.S. — d. Jan. 9, 1961, Cambridge, Mass.) U.S. sociologist and peace

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activist. She studied at Bryn Mawr College and taught at Wellesley College from 1896. She founded a settlement house in Boston and served on state commissions on industrial relations (1908-09) and immigration (1913-14). She lost her professorship in 1918 because of her opposition to U.S. entry into World War I. In 1919 she helped found, with Jane Addams, the Women's International League for Peace and Freedom. In 1946 she shared the Nobel Prize for Peace with John R. Mott (1865-1955).

bald cypress Either of two large swamp trees (Taxodium distichum and T. ascendens\ family Taxodiaceae) of the southern U.S. that are related to the sequoias. The hard red wood of cypress is often used for roofing shingles. The so-called deciduous cypress family (see deciduous tree) comprises 10 genera with 15 species of ornamental and timber evergreen trees,

native to eastern Asia, Tasmania, and North America. The leaves on a single tree may be scalelike, needlelike, or a mixture of both. Both male and female cones are borne on the same tree. The Tasmanian cedar (Ath - rotaxis), Japanese cedar (Cryptomeria japonica), China fir (Cunning - hamia lanceolata), umbrella pine (Sciadopitys verticillata), big tree, redwood, dawn redwood, and bald cypress are economically important timber trees in this family.

bald eagle Species of sea eagle (Haliaeetus leucocephalus) that occurs inland along rivers and large lakes.

Strikingly handsome, it is the only eagle native solely to North America, and it has been the U.S. national bird since 1782. The adult, about 40 in.

(1 m) long with a wingspan of 6.5 ft (2 m), is dark brown with white head and tail and yellow beak, eyes, and feet. Bald eagles snatch fish at the water surface, rob osprey of fish, and eat carrion. They nest in lone trees, often on river islands. Though still protected in the U.S., the bald eagle is no longer considered an endan- gered species.

baldachin Vbol-do-konV Free- standing canopy of stone, wood, or metal over an altar or tomb. The Ital- ian term baldacchino originally referred to brocaded material from Baghdad hung as a canopy over an altar or throne. The characteristic architectural form consists of four columns supporting entablatures, which carry miniature colonnades topped by a pyramidal or gabled roof. Gian Lorenzo Bernini’s famous bronze baldachin (1624-33) stands at St. Peter's Basilica in Rome.

Balder Vbol-dor, 'bal-dorV In Norse mythology, the just and beautiful son of Odin and Frigg. He could be harmed by nothing except mistletoe.

Knowing he was invulnerable, the gods amused themselves by throw- ing things at him. Deceived by Loki, the blind god Hod hurled mistletoe at Balder and killed him. The giant- ess Thokk, probably Loki in disguise, refused to weep the tears that would have released Balder from the underworld.

baldness or alopecia X.al-o-'pe-shoX Lack or loss of hair, either per- manent (from destruction of hair follicles) or temporary (from short-term follicle damage). Male pattern baldness is inherited and affects up to 40%

of men; treatments are transplanting of follicles from areas where hair still grows and application of drugs (e.g., minoxidil) to the scalp. Other causes of permanent baldness are skin diseases and injuries, inborn lack of hair development, and severe follicle injury. Temporary hair loss may follow high fever or come from X rays, drugs, malnutrition, or endocrine disorders. Alopecia areata, with sharply outlined patches of sudden complete baldness, is also usually temporary.

Baldovinetti X.bal-do-ve-'nat-teX, Alesso (b. Oct. 14, 1425?, Florence — d. Aug. 29, 1499, Florence) Italian artist active in Florence. Little is known of his early training, but his style shows the influence of Fra Angelico and Domenico Veneziano. Both his masterpiece, The Nativity (1460-62), a fresco in the church of the Santissima Annunziata, Florence, and his Madonna and Child (1460s) in the Louvre depict views of the Arno River valley in the background; they are among the earliest European paintings of landscapes. His work, though seldom innovative, exemplified the careful modeling of form and the accurate depiction of light characteristic of the most progressive style of Florentine painting during the last half of the 15 th century. He also designed the mosaic decoration over Lorenzo Ghiberti’s doors on the Baptistery in Florence (1453-55) and produced designs for stained glass and intarsia.

Baldung Vbal-duqV Hans or Hans Baldung Grien \'gren\ (b. c. 1484, Schwabisch Gmiind, Wiirttemberg — d. 1545, Imperial Free City of Strasbourg) German painter and graphic artist. He was assistant to Albrecht Durer in Ntimberg and was active in Strasbourg as official painter to the episcopate. He is best known for the high altar of the cathedral at Freiburg, where he lived in 1512-17. His output was varied and extensive, encompassing religious paintings, allegories, mythologies, portraits, designs for stained glass, tapestry, and book illustration. His paintings are equaled in importance by his drawings, engravings, and woodcuts, frequently depicting the themes of the “dance of death” and “death and the maiden.” In his taste for the gruesome, Baldung is close in style and spirit to Matthias GrOnewald.

Baldwin I (b. 1172, Valenciennes — d. 1205) First Latin emperor of Constantinople (1204-05). Count of Flanders and Hainaut, he was a leader of the Fourth Crusade, which was directed against the Byzantine Empire. He helped install a pro-Latin emperor (1203). When the Crusaders in Constantinople seized power, he was elected emperor (1204) and recognized by the pope. He created a government on the western European model, granting Greek lands to his knights, but was defeated, taken prisoner, and executed by invading Bulgars.

Baldwin I known as Baldwin of Boulogne \bu-'lon-y9\ (b. 1058? — d. April 2, 1118, Al-Arish, Egypt) King of Jerusalem (1100-18). The son of a French count, he joined the First Crusade and created the first Crusader state when he gained control of Edessa (now in Turkey) in 1098. In 1100 his brother Godfrey died in Jerusalem, and Baldwin was summoned by the nobles to succeed him as king of the Crusader state and defender of the Holy Sepulchre. He expanded the kingdom by conquering coastal cities such as Arsuf and Caesarea, built the important castle Krak de Montreal, and established an administration that served for 200 years as the basis for Frankish rule in Syria and Palestine.

Baldwin II known as Baldwin of Bourg \'biirk\ (d. August 1131, Jerusalem) King of Jerusalem (1118-31). A French nobleman, he joined the First Crusade and was made count of Edessa by his cousin Baldwin I in 1100. Captured by Seljuq Turks in 1104, he was ransomed four years later and reclaimed Edessa from the regent by force. He became king of Jerusalem in 1118 on the death of Baldwin I. He was held hostage by the Turks 1123-24. He later expanded his kingdom and attacked Damascus with the aid of the Knights of Malta and the Templars. He arranged the marriage of his daughter Melisend to Fulk V of Anjou and made them his successors.

Baldwin II Porphyrogenitus \,por-f9-ro-'jen-9t-9s\ (b. 1217, Constantinople — d. Oct. 1273, Foggia, Kingdom of Sicily) Fifth and last Latin emperor of Constantinople (1228-61). The son of the third Latin emperor (Porphyrogenitus means “born to the purple,” thus “of royal birth”), Baldwin inherited the throne on the death of his brother. Inva-

Bald eagle (Haliaeetus leucocephalus).

ALEXANDER SPRUNT, IV

Baldachin, St. Peter's, Vatican City, by Gian Lorenzo Bernini, 1 624-33

SCALA-ART RESOURCE/EB INC.

"Madonna and Child," oil on canvas by Alesso Baldovinetti, c. 1465; in the Louvre, Paris

GIRAUDON-ART RESOURCE/EB INC.

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sions by Greeks and Bulgars reduced the empire to the area around Constantinople, and Baldwin's empty treasury obliged him to travel twice to western Europe to ask for aid. He sold sacred relics to Louis IX of France and broke up parts of the imperial palace for firewood. He lost the throne in 1261 when Michael VIII Palaeologus captured Constantinople and restored Greek rule. Baldwin fled to Europe and later died in Sicily.

Baldwin IV known as Baldwin the Leper (b. 1161 — d. March 1185, Jerusalem) King of Jerusalem (1174-85). He was crowned at age 13 on the death of his father, but the kingdom was ruled by a series of regents. Baldwin was afflicted with leprosy throughout his short life, which contributed to power struggles among the nobility. His defeat of Saladin in 1177 led to a two-year truce, but in 1183 Saladin captured Aleppo and completed the encirclement of Jerusalem. Baldwin crowned his nephew king in 1183.

Baldwin, James (Arthur) (b.

U.S. — d. Dec. 1, 1987, Saint-Paul,

France) U.S. essayist, novelist, and playwright. He grew up in poverty in the New York City district of Harlem and became a preacher while in his teens. After 1948 he lived alternately in France and the U.S. His semiautobiographical first novel, Go Tell It on the Mountain (1953), regarded as his finest, was followed by the essay collections Notes of a Native Son (1955) and Nobody Knows My Name (1961); the novels Giovanni's Room (1956), a story of homosexual life, and Another Country (1962); the long polemical essay The Fire Next Time (1963), prophesying widespread racial violence; and the play Blues for Mister Charlie (produced 1964). His eloquence and passion on the subject of race made him for years perhaps the country's most prominent black writer.

Baldwin, Robert (b. May 12, 1804, York, Upper Canada — d. Dec. 9, 1858, Toronto) Canadian politician. Called to the bar in 1825, Baldwin began his political career as a member of the Legislative Assembly of Upper Canada for York (1829-30). In 1 842 — 43 he and Louis Hippolyte LaFontaine formed the first Liberal Party administration; when the Liberals returned to power in 1848, they were able to establish responsible, or cabinet, government. He resigned in 1851.

Baldwin, Roger (Nash) (b. Jan. 21, 1884, Wellesley, Mass., U.S. — d. Aug. 26, 1981, Ridgewood, N.J.) U.S. civil-rights leader. Born into an aristocratic Massachusetts family, Baldwin attended Harvard University and taught sociology at Washington University (1906-09) in St. Louis, where he also was chief probation officer of the city's juvenile court and secretary of its Civic League. When

the U.S. entered World War I, he became director of the pacifist American Union Against Militarism, the predecessor of the American Civil Liberties Union (ACLU). As the ACLU's director (1920-50) and national chairman (1950-55), he made civil rights, once a predominantly leftist cause, a universal one.

Baldwin (of Bewdley), Stanley Baldwin, 1st Earl (b. Aug.

3, 1867, Bewdley, Worcestershire,

Eng. — d. Dec. 14, 1947, Astley Hall, near Stourport-on-Severn, Worcestershire) British politician. After managing his family's large industrial holdings, he became a Conservative member of the House of Commons (1908-37). He served as financial secretary of the treasury

(1917-21) and president of the Board of Trade (1921-22), then was appointed prime minister (1923-24, 1924-29, 1935-37). He proclaimed a state of emergency in the general strike of 1926 and later secured passage of the antiunion Trade Disputes Act. As prime minister after 1935, he began to strengthen the British military while showing little public concern about the aggressive policies of Germany and Italy. He was criticized for not protesting the Italian conquest of Ethiopia. In 1936 he satisfied public opinion by procuring the abdication of Edward VIII, whose desire to marry divorcee Wallis Simpson, Baldwin believed, threatened the prestige of the monarchy.

Balearic Vba-le-'ar-ik\ Islands Spanish Islas Baleares Archipelago (pop., 2001: 841,669), western Mediterranean Sea, constituting an autonomous community and province of Spain. It occupies an area of 1,927 sq mi (4,992 sq km); its capital is Palma. The most important islands are Majorca, Minorca, Ibiza, Formentera, and Cabrera. Long inhabited, the islands were ruled by Carthage in the 6th century bc, by Rome from c. 120 bc, and by the Byzantine Empire from ad 534. Raided by the Arabs, the area was conquered in the 10th century by the Umayyad dynasty at Cordoba. It was reconquered by the Spanish and united with the kingdom of Aragon in 1349. After territorial challenges in the 18th century by the British, the islands came under Spanish rule in 1802. The present-day economy is fueled by tourism.

baleen whale \bo-'len, 'ba-,len\ Any of about 13 species of cetaceans in the suborder Mysticeti. They are distinguished by a specialized feeding structure, the baleen, which strains plankton and small crustaceans from the water. It consists of two horny plates attached to the roof of the mouth. Each plate (as long as 12 ft, or 3.6 m, in the right whale) is composed of parallel slats with fringes that mat together to form a sieve. Other baleen whales are the blue, fin, gray, humpback, and sei whales and the rorqual. Baleen was once used for corset stays and is still used in some industrial brushes.

Balenciaga \bal-en-'thyag-3\, Cristobal (b. Jan. 21, 1895, Guetaria, Spain — d. March 23, 1972, Valencia) Spanish-French fashion designer. He studied dressmaking as a child and was inspired to become a coutu- rier by a visit to Paris. By age 20 he had his own firm in San Sebastian. Over the next 15 years Balenciaga became the leading couturier of Spain. In 1937, when the Spanish Civil War disrupted his business, he moved to Paris. For the next 30 years his collections featured sumptuously elegant dresses and suits. Balenciaga helped popularize the trend toward capes and flowing clothes without waistlines in the late 1950s as well as the use of plastic for rainwear in the mid 1960s. He retired in 1968.

Balfour (of Whittingehame), Arthur James, 1 st Earl (b. July 25, 1848, Whittinghame, East

Lothian, Scot. — d. March 19, 1930,

Woking, Surrey, Eng.) British states- man. The nephew of the marquess of Salisbury, Balfour served in Parlia- ment (1874-1911) and in his uncle’s government as secretary for Ireland (1887-91). From 1891 he was the Conservative Party’s leader in Par- liament and succeeded his uncle as prime minister (1902-05). He helped form the Entente Cordiale (1904). His most famous action came in 1917 when, as foreign secretary (19 lb- 19), he wrote the so-called Balfour Declaration, which expressed official British approval of Zionism. He served as lord president of the coun- cil (1919-22, 1925-29) and drafted the Balfour Report (1926), which defined relations between Britain and the dominions expressed in the Statute of Westminster.

Balfour Declaration (Nov. 2, 1917) Statement issued by the British foreign secretary, Arthur James Balfour, in a letter to Lionel Walter Roth- schild, a leader of British Jewry, as urged by the Russian Jewish Zionist leaders Chaim Weizmann and Nahum Sokolow. The declaration promised the establishment of a homeland for the Jewish people in Palestine that would not disturb the non-Jewish groups already residing there. The Brit-

2, 1924, New York, N.Y.,

Baldwin

Stanley Baldwin, 1st Earl Baldwin of Bewdley, 1932.

BASSANO AND VANDYK

Arthur James Balfour, c. 1 900.

BASSANO AND VANDYK

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ish anticipated gaining a mandate over Palestine after World War I (1914-18) and hoped to win over Jewish public opinion to the side of the Allies. They also hoped that pro-British settlers would help protect the approaches to the Suez Canal, a vital link to Britain’s South Asian possessions.

Bali Vba-le, 'ba-le\ Island (pop., 2000 prelim.: 3,151,162), Indonesia. Located in the Lesser Sunda Islands, off the eastern coast of Java, it constitutes, with minor adjacent islands, a province of Indonesia. The main towns are Singaraja and Denpasar, the provincial capital. The island is mountainous; its highest peak is Mount Agung (10,308 ft [3,142 m]). Colonized by India in early times and supplemented by emigres from Java in the 16th century, Bali is the remaining stronghold of Hinduism in the Indonesian archipelago. Visited by the Dutch in the late 16th century, it came under Dutch rule only in the late 19th century. It was occupied by the Japanese in World War II and became part of Indonesia in 1950. Tourism is now one of the mainstays of its economy.

Balinese People of the island of Bali, Indon. They differ from other Indonesians in adhering to Hinduism, though their culture has been heavily influenced by the Javanese. In Balinese villages each family lives in its own compound, surrounded by earthen or stone walls; all villages have temples and an assembly hall. Balinese religion fuses Hindu Shaivism with Buddhism, ancestor cults (see ancestor worship), and belief in spirits and magic. Marriage is often limited to members of the same kinship organization, and family relationships are reckoned through the male line.

Balkan League Vbol-konX (1912-13) Alliance of Bulgaria, Serbia, Greece, and Montenegro, which fought the first Balkan War against the Ottoman empire. Ostensibly created to limit Austrian power in the Balkans, the league was actually formed at the instigation of Russia to expel the Turks from the Balkans. The league disintegrated when its members quarreled over the division of territorial spoils after their victory in the first Balkan War.

Balkan Mountains Bulgarian Stara Planina Vsta-ra-.pla-ne-'naV Mountain range, southeastern Europe. It extends east to west across central Bulgaria from the Black Sea to the Serbian border; the highest point is Botev Peak, at 7,795 ft (2,376 m). The range forms the major divide

between the Danube River in the north and the Maritsa River in the south. It is crossed by about 20 passes (notably Shipka Pass), several railway lines, and the Iskur River.

Balkan Wars (1912- 13) Two military conflicts that deprived the Ottoman Empire of almost all its remaining territory in Europe. In the First Balkan War, the Balkan League defeated the Ottoman Empire, which, under the terms of the peace treaty (1913), lost Macedonia and Albania. The Second Balkan War broke out after Serbia, Greece, and Romania quarreled with Bulgaria over the division of their joint conquests in Macedonia. Bulgaria was defeated, and Greece and Serbia divided up most of Macedonia between themselves. The wars heightened tensions in the Balkans and helped spark World War I.

Balkans or Balkan Peninsula Peninsula, southeastern Europe. Located between the Adriatic Sea, the Mediterranean Sea, and the Aegean and Black seas, it contains many countries, including Slovenia, Croatia, Bosnia and Herzegovina, Macedonia, Serbia and Montenegro, Moldova, Romania, and Bulgaria. From 168 bc to ad 107, part of the area was incorporated into Roman provinces, including Epirus, Moesia, Pannonia, Thrace, and Dacia. It was subsequently settled by Slavic invaders, Serbs, Croats, Slovenes, and Slavonized Bulgars, the last of whom were pushed into the Balkan region in the 6th century. It was gradually organized into kingdoms, many of which were overrun by the Ottoman Empire in the 14th- 15th century. The factional strife that occurred there from the early 20th century, provoking the continual breakups and regroupings of different states, introduced the word balkanize into English.

Balkhash, Lake or Lake Balqash Vbal-'kash\ Lake, southeastern Kazakhstan. It is about 375 mi (600 km) long, with a maximum depth of roughly 85 ft (25 m). Its chief feeder is the Ili River, which enters at the west in a wide delta. Harsh climate affects its size greatly; its area has varied from about 6,000 sq mi (15,500 sq km) to 7,300 sq mi (19,000 sq km), depending on seasonal precipitation. It is frozen from November to early April. Since the mid-20th century, industrial pollution has caused severe ecological damage.

Ball, Lucille (Desiree) (b. Aug. 6, 1911, Celoron, near Jamestown, N.Y., U.S. — d. April 26, 1989, Los Angeles, Calif.) U.S. actress and television star. She performed in films from 1933 and starred in a comedy radio series from 1947. With her bandleader husband, Desi Arnaz, she created the very successful television comedy series I Love Lucy (195 1—57) and later the Lucy-Desi Comedy Hour (1957-60). After their divorce in 1960, Ball appeared in The Lucy Show (1962-68) and Here’s Lucy (1968-74). With her red hair and rasping voice and a comic persona alternately brassy and feminine, she was the preeminent female star of the early decades of television.

ball bearing One of the two types of rolling, or antifriction, bearings (the other is the roller bearing). Its function is to connect two machine members that move relative to one another so that the frictional resistance to motion is minimal. In many applications, one of the members is a rotating shaft and the other a fixed housing. Each ball bearing has three main parts: two grooved, ringlike races and a number of balls. The balls fill the space between the two races and roll with negligible friction in the grooves. The balls may be loosely restrained and separated by means of a retainer or cage.

ballad Form of short narrative folk song. Its distinctive style crystallized in Europe in the late Middle Ages as part of the oral tradition, and it has been preserved as a musical and literary form. The oral form has persisted as the folk ballad, and the written, literary ballad evolved from the oral tradition. The folk ballad typically tells a compact tale with deliberate starkness, using devices such as repetition to heighten effects. The modern literary ballad (e.g., those by W.H. Auden, Bertolt Brecht, and Elizabeth Bishop) recalls in its rhythmic and narrative elements the traditions of folk balladry.

ballad opera English 18th-century comic opera in which songs and musical interludes, usually consisting of existing popular tunes or opera melodies with new words, are interspersed with spoken dialogue. The first ballad opera, The Beggar’s Opera (1728), by John Gay and J.C. Pepusch (1667-1752), was a sharply satirical work that became wildly popular and led to numerous similar works. Ballad opera led directly to the German singspiel and can be seen as the source of the modern musical.

ballade \ba-'lad\ One of several formes fixes in French lyric poetry and song, cultivated particularly in the 14th— 15th centuries. It consists of three main stanzas having the same rhyme scheme plus a shortened final dedicatory stanza; all four stanzas have identical final refrain lines. The texts were often solemn and formal, containing elaborate symbolism and classical references. Though present in the poetry of many ages and regions, the ballade in its purest form was found only in France and England. Its precursors can be found in the songs of the troubadours and trouveres.

Ballard Vbal-ordV, J(ames) G(raham) (b. Nov. 15, 1930, Shanghai, China) British writer. Ballard spent four years of his childhood in a Japanese prison camp, an experience he described in Empire of the Sun (1984; film, 1987). His science fiction is often set in ecologically unbalanced landscapes caused by decadent technological excess. His apocalyptic novels, often shockingly violent, include Crash (1973; film, 1996), Concrete Island (1974), and High Rise (1975). His later works include the short-story collection War Fever (1990) and the novels The Kindness of Women (1991) and Cocaine Nights (1998).

Ballard Vba-brd\, Robert D(uane) (b. 1942, Wichita, Kan., U.S.) U.S. oceanographer and marine geologist. He grew up near San Diego, Calif. As a marine scientist at the Woods Hole (Mass.) Oceanographic Research Institution, he pioneered the use of deep-diving submersibles, participated in the first manned exploration of the Mid-Atlantic Ridge, and discovered warm water springs and their unusual animal communities in the Galapagos Rift. He is best known for his dramatic discovery of the wreck of the Titanic in 1985. Since then he has gone on to discover ships lost in battle during World War II.

Ballesteros \ l bal-os- , ter-os\ / Seve(riano) (b. April 9, 1957, Pedrena, Spain) Spanish golfer. One of four professional golfing brothers, he fre-

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quently won the British Open (1979, 1984, 1988) and the Masters (1980, 1983) and captained the 1997 European Ryder Cup team to victory. Known for his flamboyant and imaginative style of play, by the late 1990s he had accumulated more than 70 wins in international tournaments.

ballet Theatrical dance in which a formal academic technique (the danse d’ecole) is combined with music, costume, and stage scenery. Developed from court productions of the Renaissance, ballet was renewed under Louis XIV, who in 1661 established France’s Academie Royale de Danse, where Pierre Beauchamp developed the five ballet positions. Early ballets were often accompanied by singing and incorporated into opera-ballets by composers such as Jean -Baptiste Lully. In the 18th century Jean-Georges Noverre and Gasparo Angiolini separately developed the dramatic ballet (; ballet d’ action) to tell a story through dance steps and mime, a reform echoed in Christoph Willibald Gluck’s music. Significant developments in the early 19th century included pointe work (balance on the extreme tip of the toe) and the emergence of the prima ballerina, exemplified by Marie Taglioni and Fanny Elssler. In the late 19th and early 20th centuries, Russia became the centre of ballet production and performance, through the work of innovators such as Sergey Diaghilev, Anna Pavlova, Vaslav Nijinsky, Marius Petipa, and Michel Fokine; great ballets were composed by Pyotr Tchaikovsky and Igor Stravinsky. Since then, ballet schools in Great Britain and the U.S. have elevated ballet in those countries to Russia’s level and greatly increased its audience. See also American Ballet Theatre; Ballet Russe de Monte Carlo; Ballets Russes; Bolshoi Ballet; New York City Ballet; Royal Ballet.

ballet position Any of the five positions of the feet fundamental to all classical ballet. First codified by Pierre Beauchamp (1636-1705) in 1680, the positions form the base from which a dancer achieves stability or aplomb, the basic law of ballet. Fundamental to all the positions is the turnout, or rotation of the dancer’s legs out from the hips, which creates a firm basis for movement in any direction. Various positions of the arms and hands (port de bras) complete the figures.

Arabesque executed by Natalya Bessmertnova, with Nikolay Fadeychev, of the Bolshoi Ballet; Swan Lake

NOVOSTI — SOVFOTO

Ballet Russe de Monte Carlo \ba-la-Yms-d3-mo n -ta-'kar-lo\ Ballet company formed in Monte Carlo in 1932. The name derived from Sergey Diaghilev' s Ballets Russes, which dissolved after his death in 1929. Under Rene Blum and Col. W. de Basil, the company presented works by Leonide Massine and George Balanchine and featured Alexandra Danilova, Andre Eglevsky, and David Lichine. In 1938 clashes split the company into two groups: the Original Ballet Russe (led by de Basil), which toured internationally before dissolving in 1948; and the Ballet Russe de Monte Carlo

(led by Massine), which toured mainly in the U.S. with Danilova, Alicia Markova, and Maria Tallchief until 1963.

Ballets Russes \ba-la-'riEs\ Ballet company founded in Paris in 1909 by Sergey Diaghilev. Considered the source of modern ballet, the company employed the most outstanding creative talent of the period. Its choreographers included Michel Fokine, Leonide AAassine, Bronislava Nijinska, and George Balanchine, and among its dancers were Yekaterina Geltzer, Tamara Karsavina, and Vaslav Nijinsky. Music was commissioned from composers such as Igor Stravinsky, Maurice Ravel, Darius Milhaud, Sergey Prokofiev, and Claude Debussy, and ballets featured stage designs by artists Alexandre Benois, Pablo Picasso, Georges Rouault, Henri Matisse, and Andre Derain.

Ballinger Vbal-in-jorV Richard A(chilles) (b. July 9, 1858, Boonesboro, Iowa, U.S. — d. June 6, 1922, Seattle, Wash.) U.S. secretary of the interior (1909-11). As the reform mayor of Seattle, Wash. (1904-06), he attracted national attention. In 1907 he was appointed commissioner of the General Land Office, and in 1909 he became secretary of the interior. During his two years in that post he sought to make public resources more available for private exploitation. Implicated in a fraudulent Alaskan land-claims scheme, he was cleared after a congressional investigation but resigned in 1911. The episode split the Republicans between conservatives led by Pres. William H. Tar and progressives loyal to Theodore Roosevelt.

Balliol, John de See John (Scotland)

ballista \bo-Tis-t3\ Ancient missile launcher designed to hurl long arrows or heavy balls. The Greek version was basically a huge crossbow fastened to a mount. The Roman ballista was powered by torsion derived from two thick skeins of twisted cords through which were thrust two separate arms joined at their ends by the cord that propelled the missile. The largest could accurately hurl 60-lb (27-kg) weights up to about 500 yards (450 m).

ballistics Science of propulsion, flight, and impact of projectiles. Internal ballistics deals with propulsion of projectiles, such as within the barrel of a gun or at a rocket launch. Guns and rocket engines convert chemical energy of propellants into kinetic energy of projectiles. External ballistics deals with projectile flight. The trajectory, or path, of a projectile is subject to the forces of gravity (see gravitation), drag, and lift. Terminal ballistics deals with the impact of projectiles on a target. Wound ballistics deals with the mechanisms and medical implications of trauma caused by bullets and explosively driven fragments, such as shrapnel.

balloon Large airtight bag filled with hot air or a lighter-than-air gas such as helium or hydrogen that can rise and float in the atmosphere. Experi-

mental attempts may have begun by 1709, but not until 1783 did J.-M. and J.-E. Montgolfier develop a fabric-bag balloon that would rise when filled with hot air. Balloons provided military aerial observation sites in the 19th century and were used in the 20th century by scientists such as Auguste Piccard to gather high-altitude data. The first round-the-world balloon flight was achieved in 1999 by Bertrand Piccard and Brian Jones. See also airship.

ballooning Flying in a balloon in competition or for recreation. Sport ballooning began in the early 20th century and became popular in the 1960s. The balloons used are of lightweight synthetic materials (e.g., polyester coated in aluminized mylar) and are filled with hot air or lighter-than-air gas. Balloon races often involve tasks such as changing elevations or landing on or near a target. Competitions are regulated by the Federation Aeronautique Internationale. The first transatlantic, transcontinental, and transpacific balloon flights were achieved in 1978, 1980, and 1981, respectively. In 1997-98 international teams began competing to become the first to balloon nonstop around the world. This feat was finally accomplished in 1999 by the Swiss psychiatrist Bertrand Piccard (grandson of famed physicist and balloonist Auguste Piccard) and his British copilot Brian Jones, who spent 19 days in the air.

Ballot Act (1872) British law that introduced the secret ballot for all parliamentary and municipal elections. The secret ballot was also called the Australian ballot, because it was first used in Australian elections (1856). The British law, which was designed to protect voters from bribery and coercion, was one of the important achievements of William E. Gladstone’s first administration.

ballot initiative See referendum and initiative

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ballroom dance European and American social dancing performed by couples. It includes standard dances such as the fox-trot, waltz, polka, tango, Charleston, jitterbug, and merengue. Ballroom dance was popularized by Vernon and Irene Castle and Fred Astaire and, later, by Arthur Murray (1895-1991), who established ballroom dance studios throughout the U.S. Ballroom dance contests, especially popular in Europe, feature both amateur and professional dancers.

Ballycastle Town (pop., 1991: 4,005), district seat of Moyle, Northern Ireland. It is situated along Ballycastle Bay, opposite an island where Scotland’s King Robert I is said to have hidden from enemies in a cave. It is a market centre, fishing harbour, and resort.

Ballymena V.ba-le-'me-noV District (pop., 2001: 58,610), Northern Ireland. Established in 1973, it is an agricultural area. The Antrim Mountains, which reach a height of 1 ,430 ft (435 m), traverse the eastern part

of the district, sloping toward the valley of the River Main. Ballymena town, the district seat, is a marketing centre for the surrounding area; it has long been known for its linen and woolen production.

Ballymoney V.ba-le-'ms-neX District (pop., 2001: 26,894), Northern Ireland. Established in 1973, it is an agricultural area intersected by the Antrim Mountains. The town of Ballymoney is the district seat.

balm Any of several fragrant herbs of the mint family, particularly Melissa officinalis (balm gentle, or lemon balm), cultivated in temperate climates for its fragrant leaves, which are used as a scent in perfumes and as a flavouring. The name is also applied to Melittis melis sophy llum (bastard balm), Monarda didyma (bergamot, or bee balm), Collinsonia canadensis (horse balm), Glecoma hederacea and Satureja (Calamintha) nepeta (field balm), and Molucella laevis (Molucca balm, or bells of Ireland), as well as to aromatic substances from species of Commiphora (trees and shrubs of the incense-tree family).

Balmain \bal-'ma n \, Pierre (-Alexandre-Claudius) (b. May 18,

1914, Saint-Jean-de-Maurienne, Fr. — d. June 29, 1982, Paris) French fashion designer. He gave up architectural studies to become a designer in 1934. He worked briefly with Christian Dior, who became his rival after World War II. Balmain’s designs, particularly for evening wear, were characterized by superb quality and a combination of femininity and imposing elegance; his clients included film stars and royalty. He later opened branches in New York City and Caracas and expanded into perfume and accessories.

Balochi \b3-'lo-che\ or Baluchi \b3-'lu-che\ Any member of a group of tribes speaking the Balochi language and inhabiting the province of Balochistan in Pakistan and neighbouring areas of Iran, Afghanistan, Bahrain, and the Punjab (India). Some 70% of the total Balochi population live in Pakistan, where they are divided into two groups, the Sulaimani and the Makrani. Mentioned in 10th-century Arabic chronicles, they probably came originally from the Iranian plateau. Traditional Balochis are nomads, but settled agricultural existence is becoming more common. They raise camels and other livestock and engage in carpet making and embroidery.

Balochistan Xbo-.lo-chi-'stanN or Baluchistan Xbo-.lii-chi-'stanN Province (pop., 1998: 6,511,000), southwestern Pakistan. Its capital is Quetta (pop., 1998: 560,307). Its landscape includes mountains, notably the Sulaiman and Kithar ranges; barren, flat plains; arid desert; and marshy swamps. In ancient times, it was part of Gedrosia. Alexander the Great traversed it in 325 bc. It was included in the Bactrian kingdom, then was ruled by Arabs from the 7th to the 10th century ad. It was ruled by Persia for centuries, with the exception of a period when it belonged to the Mughal Empire (1594-1638). It became a British dependency in 1876 and a British province of India in 1887. It was made part of Pakistan in 1947^-8 and was designated a separate province in 1970. Wheat, sorghum, and rice are staple crops; manufactures include cotton and woolen goods.

Balqash, Lake See Lake Balkhash

balsa Tree (Ochroma pyramidale, or O. lagopus) of the bombax family (Bombacaceae), native to tropical South America and noted for its

extremely light wood, which resembles clear white pine or basswood. Because of its buoyancy (about twice that of cork), balsa has long been used for making floats for lifelines and life preservers. Its resilience makes it an excellent shock-absorbing packing material. Its insulating properties make it a good lining material for incubators, refrigerators, and cold-

storage rooms. Because it combines lightness and high insulating power, it is a valuable construction material for transportation containers for dry ice (solidified carbon dioxide). It is also used in the construction of airplane passenger compartments and in model airplanes and boats.

balsam Aromatic resinous substance that flows from a plant, either spontaneously or from an incision, and is used chiefly in medicinal preparations. Some of the more aromatic varieties are used in incense. Balsam of Peru, a fragrant, thick, deep brown or black fluid used in perfumes, is a true balsam, from a lofty leguminous tree, Myroxylon pereirae, native to and introduced into Sri Lanka. Balsam of Tolu (Colombia) is used in perfumes and in cough syrups and lozenges; it hardens with age. Canada balsam and Mecca balsam are not true balsams.

balsam poplar North American poplar (Populus balsamifera), native from Labrador to Alaska and across the extreme northern U.S. Often cultivated as a shade tree, it has buds thickly coated with an aromatic resin that is used to make cough syrups. It grows best in northwestern Canada.

Balthus \bal-'tiEs\ orig. Balthazar Klossowski (b. Feb. 29, 1908, Paris, Fr. — d. Feb. 18, 2001, La Rossiniere, Switz.) French painter. Bom in Paris to Polish parents, he was considered a child prodigy and was encouraged by family friends including Pierre Bonnard, Andre Derain, and Rainer Maria Rilke. Without formal training, he supported himself through commissions for stage sets and portraits. He had his first one-man show in 1934. In the midst of 20th-century avant-gardism, he explored the traditional categories of European painting: the landscape, the still life, the subject painting, and the portrait. He presented ordinary moments of contemporary life on a grand scale and utilized traditional, Old Master painting techniques. Balthus is best known for his controversial depictions of adolescent girls. His disturbing and erotic images and his carefully cultivated persona made him an international cult figure. From 1961 to 1977 he served as director of the French Academy in Rome.

Baltic languages Branch of the Indo-European language family that includes three attested languages, Lithuanian, Latvian, and Old Prussian. They were or are spoken along the eastern and southeastern shore and hinterlands of the Baltic Sea. Medieval chronicles report four other Baltic-speaking peoples in the region, though by the 16th century these peoples had been completely assimilated. Baltic has certain striking features in common with Savic languages, though the deep divisions within Baltic itself, among other factors, make the hypothesis of a common Balto-Slavic protolanguage difficult to defend.

Baltic religion Ancient beliefs and practices of the Balts of Eastern Europe. They are believed to give evidence of a common source with Vedic and Iranian religion. The most important Baltic divinities were sky gods: Dievs (the sky), Perkons (the thunderer), Saule (sun goddess), and Meness (moon god). A forest divinity, the Mother of the Forest, was common to all Baltic peoples and was differentiated into goddesses that personified various aspects of nature. Destiny or luck was personified as the goddess

Laima, who determined a person's fate at the moment of birth. The dead were thought to revisit the world as good or evil spirits; evil was also done by the devil. Veins, and by a werewolf-like creature known as Vilkacis or Vilkatas. The structure of the world, with the world tree at its center, and the enmity between Saule and Meness are important themes. Festivals marked the summer solstice, the harvest, marriages, and funerals. Worship was conducted at holy groves and small hills; excavations have also revealed circular wooden temples.

Baltic Sea Sea, northern Europe. An arm of the Atlantic Ocean, connecting with the North Sea, it is about 1,000 mi (1,600 km) long, covers an area of about 149,000 sq mi (386,000 sq km), and has a maximum depth of about 1,500 ft (450 m). It receives the Vistula and Oder rivers and many other rivers. It is enclosed by Denmark, Sweden, Finland, Estonia, Latvia, Lithuania, Poland, Germany, and Russia. It has two large arms, the Gulf of Bothnia and the Gulf of Finland. The modifying effect of the North Atlantic Current is scarcely felt; its waters contain only about one-fourth as much salt as the oceans, and it freezes readily.

Baltic States Republics of Lithuania, Latvia, and Estonia, situated on the eastern shore of the Baltic Sea. The name has sometimes been used to include Finland and Poland. They were created as independent states in 1917 from the Baltic provinces of Russia, the city of Kovno, and part of the Polish department of Wilno (later Lithuania). With the aid of German and Allied forces, the Baltic states repelled a Bolshevik invasion in 1919. In 1940 they were forcibly occupied by the Soviet Union and incorpo-

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rated as constituent republics. In 1944 Soviet troops recovered the territory overrun by German forces in 1941. The Baltic states gained independence on the breakup of the Soviet Union in 1991.

Baltimore, David (b. March 7, 1938, New York, N.Y., U.S.) U.S. virologist. He received his doctorate from the Rockefeller Institute. He and Howard Temin (1934-94), working independently, discovered an enzyme that synthesizes DNA from RNA, the reverse of the usual process. This enzyme, reverse transcriptase, has become an invaluable tool in recombinant DNA technology. The research of Baltimore, Temin, and Renato Dulbecco helped illuminate the role of viruses in cancer; the three men shared a Nobel Prize in 1975. In 1990 Baltimore became president of Rockefeller University; in 1997 he became president of the California Institute of Technology.

Baltimore (of Baltimore), George Calvert, 1st Baron (b.

1578/79, Kipling, Yorkshire, Eng. — d. April 15, 1632) English colonialist. He served in the House of Commons from 1621; charged with communicating the policy of James I, he was distrusted by Parliament. After declaring himself a Roman Catholic (1625), he gave up his office and was created Baron Baltimore, receiving land grants in Ireland. To assure the

prosperity of his New World holdings, he took his family to his Newfoundland colony in 1628. Because of conflict over his Catholicism and the severe climate, he petitioned Charles I for a land grant in the Chesapeake Bay area. He died before the charter was granted, and his son Cecil became proprietor of the colony of Maryland.

Baltimore City (pop., 2000: 651,154), north-central Maryland, U.S. Located at the head of the Patapsco River estuary, 15 mi (24 km) above Chesapeake Bay, it is Maryland's largest city and economic hub. Established in 1729, it was named after the Irish barony of Baltimore (seat of the Calvert family, proprietors of the colony of Maryland). It became the first U.S. Roman Catholic diocese in 1789. In 1827 the nation's first railroad began operations there. In World War I, Baltimore began to develop industrially, and it has since become a major seaport.

Baltimore and Ohio Railroad (B&O) First steam-operated railway in the U.S. to be chartered as a common carrier of freight and passengers (1827). The B&O was established by Baltimore merchants to foster trade with the West. By 1852 the railroad extended to Wheeling, Va. (now W.V.), and in the next two decades it reached Chicago, 111., and St. Louis, Mo. The B&O's long-distance passenger trains were discontinued in 1971 after Amtrak was established. Many of B&O's operations were assumed by the CSX Corp. in 1980.

Baltimore Sun Daily newspaper published in Baltimore, Md., U.S. It was begun as a four-page penny tabloid in 1837 by Arunah Shepherdson Abell, a journeyman printer from Rhode Island. Known through much of its history for its coverage of national and international news, the paper was run by Abell's family until 1910, when control passed to a group of Baltimore businessmen, including H. Crawford Black. Members of Black's family were chairmen of the board until 1984. In 1986 the Sun was acquired by the Times Mirror Company, which in turn was acquired by the Tribune Company in 2000. Author H.L. Mencken was for years prominently associated with the Sun.

Baluba See Luba
Baluchistan See Balochistan

Balzac \bal-'zak\, Honore de orig. Honore Balssa (b. May 20,

1799, Tours, France — d. Aug. 18, 1850, Paris) French writer. Balzac began working as a clerk in Paris at about age 16. An early attempt at a business career left him with huge debts, and for decades he toiled incessantly to improve his worsening financial condition. In 1829 his novels and stories began to achieve some success, and his early masterpieces soon followed. In a vast series he collectively called The Human Comedy, eventually numbering some 90 novels and novellas, he sought to produce a comprehensive picture of contemporary society by presenting all the varieties of human nature. Among his masterpieces are Eugenie Grandet (1833), Pere Goriot (1835), Lost Illusions (1837-43), A Harlot High and Low (1843-47), and Cousin Bette (1846). His novels are notable for their great narrative drive, their large casts of vital and diverse characters, and their obsessive interest in and examination of virtually all spheres of life. His best-known story collection is his Droll Stories, 3 vol. (1832-37). His tumultuous life was one of mounting debts and almost incessant toil, with frequent bouts of writing feverishly for 15 hours at a stretch (his death has been attributed to overwork and excessive coffee

consumption). He is generally considered the major early influence on realism, or naturalism, in the novel and one of the greatest fiction writers of all time.

Bamako Vba-ma-.koX City pop.,

1996: metro area, 809,552), capital of Mali. Located in southwestern Mali on the Niger River, it was a settlement of a few hundred inhabitants when it was occupied by the French in 1880.

It became the capital of the former colony of French Sudan in 1908.

Now spanning both sides of the river, it has several colleges and most of Mali's industrial enterprises. The city more than tripled in size in the 1960s, largely because of rural migration from drought- stricken areas of the countryside.

Bambara \bam-'bar-3\ People of the upper Niger region of Mali who speak a Mande language of the Niger-Congo family. Numbering 3.4 million, the Bambara use the distinctive N'ko alphabet, which reads from right to left, and they are noted for their wood and metal sculptures. In the 17th— 1 8th centuries the Bambara developed two separate empires, one based in Segou (and including Timbuktu) and the other in Kaarta.

bambocciati V.bam-bo-'chat-eV (Italian: "childishnesses") Small, anecdotal paintings of everyday life made in Rome in the mid- 17th century. The genre's originator and most noteworthy exponent was the Dutch painter Pieter van Laer (1599-1642); the word derives from his nickname, II Bamboccio ("Little Clumsy One," reflecting his physical deformity). Van Laer arrived in Rome from Haarlem c. 1625 and influenced various other northern European painters active in Rome. Their images depicting the lower classes in humorous or grotesque ways were condemned by the leading critics and painters. The bamboccianti (painters of bambocciati) influenced the Dutch genre painters Adriaen Brouwer and Adriaen van Ostade.

bamboo Any of the tall, treelike GRASSes, found in tropical and subtropical to mild temperate regions, that make up the subfamily Bambusoideae, family Poaceae (or Gramineae). Bamboos are giant, fast-growing grasses with woody stems. A few species of the genus Arundinaria are native to the southern U.S., where they form dense canebrakes along riverbanks and in marshy areas. The woody, hollow aerial stems grow in branching clusters from a thick rhizome, often forming a dense undergrowth that excludes other plants. All parts of the bamboo are used, for purposes including food, livestock fodder, fine-quality paper, construction materials, and medicines. Bamboos also have ornamental use in landscape gardens.

Bambuti \ba-em-'bii-te\ or Mbuti A number of Pygmy peoples of the Ituri Forest of eastern Congo (Kinshasa). Bambuti is a collective name for four populations of Ituri Pygmies — the Sua (Asua), Aka, Efe, and Mbuti —

each of which has formed a loose economic and cultural interdependency with an agricultural group. They average under 4 ft 6 in. (137 cm) in height. Probably the earliest inhabitants of the region, they are nomadic hunters and gatherers living in small groups of from 10 to 100. They have no chiefs or formal councils of elders and believe in a benevolent forest deity. Their music, complex in rhythm and harmony, is often accompanied by dance or mime. Today they number in the tens of thousands.

banana Fruit of the genus Musa (family Musaceae), a gigantic herbaceous plant spread by rhizomes, and one of the most important food crops of the world. The banana is consumed extensively throughout the tropics, where it is grown, and is also valued in the temperate zone for its flavour, nutritional value, and constant availability. Hundreds of varieties are cultivated. Perhaps the most important species is the common banana, M. sapientum. The ripe fruit is high in carbohydrates (mainly sugar), potassium, and vitamins C and A, and it is low in protein and fat. Though usually eaten fresh, bananas may also be cooked. The U.S. imports more bananas than does any other country. See also plantain.

Banbridge District (pop., 2001: 41,392), Northern Ireland, established in 1973. The area includes the Legananny Hills, which reach an altitude of 1,745 ft (532 m) in eastern Banbridge district and slope southwestward to lowlands that are bisected by the River Bann. Located on the Bann is

Honore de Balzac, daguerreotype, 1848.

J.E. BULLOZ

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the town of Banbridge, established in 1712; it is the district seat and the main agricultural and population centre of the region.

Banco, Nanni di See Nanni di Banco

Bancroft, George (b. Oct. 3, 1800, Worcester, Mass., U.S. — d. Jan. 17, 1891, Washington, D.C.) U.S. historian. Bancroft was educated at Harvard and several German universities. He was minister to England (1846^19), Prussia (1867-71), and the German empire (1871-74). He was the first scholar to plan a comprehensive study of the U.S. from the colonial days through the end of the Revolutionary War. His 10-volume

History of the United States (1834–

40, 1852-74) reflected his belief that the U.S. represented humanity's closest approximation yet to the perfect state and earned him his reputation as the "father of U.S. history."

band Type of human social organization consisting of a small number of nuclear families (see family) or related subgroups who are loosely organized for purposes of subsistence or security. Bands may be integrated into a larger community or tribe. They generally exist in sparsely populated areas and possess relatively simple technologies; their habitats range from the desert (Australian Aboriginals) to the African rainforest (Bambuti) to the North American tundra (Kaska). Bands may occasionally coalesce for broader community ceremonies, hunting, or warfare. See also hunting AND GATHERING SOCIETY; SOCIOCULTURAL EVOLUTION.

band Musical ensemble that generally excludes stringed instruments. Ensembles of woodwind, brass, and percussion instruments originated in 15th-century Germany, taking on a particularly military role; these spread to France, Britain, and eventually the New World. In the 15th– 1 8th centuries, many European towns had town musicians, or waits, who performed especially for ceremonial occasions in wind bands often consisting primarily of shawms and sackbuts (trombones). In the 18th– 19th centuries, the English amateur brass band, largely consisting of the many newly developed brass instruments, took on the important nonmilitary function of representing organizations of all kinds. In the U.S., Patrick Gilmore's virtuoso band became famous in the mid- 19th century; his greatest successor, John Philip Sousa, bequeathed a repertory of marches that has remained very popular. The "big band," under leaders such as Duke Ellington and Count Basie, was central to American popular music in the 1930s and '40s. In the rock band, unlike most other bands, stringed instruments (electric guitars and electric bass) are paramount.

band theory In chemistry and physics, a theoretical model describing the states of electrons in solid materials, which can have energy values only within certain specific ranges, called bands. Ranges of energy between two allowed bands are called forbidden bands. As electrons in an atom move from one energy level to another, so can electrons in a solid move from an energy level in one band to another in the same band or in another band. The band theory accounts for many of the electrical and thermal properties of solids and forms the basis of the technology of devices such as semiconductors, heating elements, and capacitors (see capacitance).

Banda, Hastings (Kamuzu) (b. c. 1898, near Kasungu [Malawi] – d. Nov. 25, 1997, Johannesburg, S.Af.) First president of Malawi (1963-94). Educated as a physician in the U.S., Banda moved to Scotland and practiced medicine there. He became involved in politics when white settlers demanded the federation of Nyasaland (later Malawi) and the Rhodesias in 1949. In the 1950s he toured the country making antifederation speeches, for which he was imprisoned by British colonial officials. In 1963, when the federation was dissolved, he became prime minister. He concentrated on building his country's infrastructure and increasing agricultural productivity. Declared president for life in 1971, his rule became increasingly autocratic and austere. He was voted out of

office in 1994.

Bandama \ban-'da-ma\ River River, central Cote d'Ivoire. The longest and commercially most important river in Cote d'Ivoire, it and its

George Bancroft, photograph by Mathew Brady

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tributaries drain half the country's surface area. It rises in the highlands and flows southward 497 mi (800 km) to enter the Gulf of Guinea and the Taga Lagoon. A major hydroelectric plant is sited at Kossou.

Bandar Seri Begawan Vban-dar-'ser-e-be-'ga-wan \ formerly Brunei Town City (pop., 2001: city, 27,285; 2002 est.: metro, area, 74,700), capital of Brunei. Lying along the Brunei River near its mouth on Brunei Bay, it is a trade centre and river port. Heavily damaged during World War II, it was largely rebuilt; newer buildings include the largest mosque in eastern Asia.

Bandaranaike N.bon-do-ro-'nl-koX, S(olomon) W(est) Ridgeway) D(ias) (b. Jan. 9, 1899,

Colombo, Ceylon — d. Sept. 26,

1959, Colombo) Statesman and prime minister (1956-59) of Ceylon (Sri Lanka). Educated at the University of Oxford, he became a prominent member of Ceylon's Western-oriented United National Party. In 1952 he founded the nationalist Sri Lanka Freedom Party, becoming the opposition leader in the legislature.

He later formed an alliance of four nationalist-socialist parties that swept elections in 1956 and made him prime minister. Under Bandaranaike, Sinhalese replaced English as the country's official language, Buddhism (the majority religion) was given a prominent place in the affairs of state, and Ceylon established diplomatic relations with

communist states. He was assassinated in 1959. His widow, Sirimavo Ratwatte Dias Bandaranaike (1916-2000), became the world's first woman prime minister in 1960, serving until 1965; she was prime minister twice more (1970-77 and 1994-2000). During her second term a new constitution was adopted that proclaimed a republic (1972) and

changed the country's name to Sri Lanka. She was appointed to a third term when her daughter, Chandrika Bandaranaike Kumaratunga (b. 1945), became president in 1994.

S.W.R.D. Bandaranaike

bandeira \ban-'der-o\ Series of 17th-century Portuguese slave-hunting expeditions into the interior of Brazil. Bandeiras consisted of anywhere from 50 to several thousand men (known as bandeir antes), usually from Sao Paulo, who were organized and controlled by wealthy entrepreneurs. The bandeirantes penetrated unmapped regions and expanded Portuguese claims to the South American interior. Along the way they built roads, established settlements, and laid the basis for ranching and agriculture in the interior while reaping large profits and inflicting untold hardship on local Indian tribes.

Bandelier \,ban-d9-'lir\ National Monument Archaeological area, north-central New Mexico, U.S. Lying along the Rio Grande 20 mi (32 km) northwest of Santa Fe, it was established in 1916. It occupies an area of 51 sq mi (132 sq km) and was named for Adolph Bandelier, a Swiss-American archaeologist. The monument contains many cliff and open-pueblo ruins of pre-Columbian Indians (mostly 13th-century) in Frijoles Canyon. Stone sculptures and man-made caves have also been unearthed.

bandicoot Any of about 22 species of marsupials (family Peramelidae) found in Australia, Tasmania, New Guinea, and nearby islands. Bandicoots are 12-30 in. (30-80 cm) long, including the 4- to 12-in. (10- to 30-cm) sparsely haired tail. They have a stout, coarse-haired body, a tapered muzzle, and hindlimbs longer than their forelimbs. Unlike other marsupials, bandicoots have a placenta. They are terrestrial, solitary animals that dig pits to search for insect and plant food. Farmers consider them pests. All species have declined, and some are now endangered.

Long-nosed bandicoot (Perameles nasuta).

WARREN GARST-TOM STACK AND ASSOCIATES

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Bandinelli, Baccio (b. Nov. 12, 14937, Florence — d. Feb. 7, 1560, Florence) Italian sculptor and painter active in Florence. Though trained as a goldsmith by his father, he soon became one of the principal sculptors at the Medici court. He often failed to complete his commissions and was accused of jealousy and incompetence by Benvenuto Cellini and Giorgio Vasari. He is remembered more for accounts of his unattractive character than for the quality of his work, although surviving works prove him to have been a more distinguished sculptor than his contemporaries allowed. His most famous sculpture is Hercules and Cacus (1534), in the Piazza della Signoria.

Bandung \'ban-duq\ City (pop., 1996 est.: 2,429,000), Indonesia. The capital of West Java province, it was founded by the Dutch in 1810 in the interior of Java on a 2,400-ft (730-km) plateau. It is surrounded by beautiful scenery. It is the centre of cultural life for the Sundanese, who compose most of West Java's population and differ in customs and language from their Javanese neighbours. It is a centre for the study and preservation of Sundanese culture and an educational centre.

bandwidth Measurement of the capacity of a communications signal. For digital signals, the bandwidth is the data speed or rate, measured in bits per second (bps). For analog signals, it is the difference between the highest and lowest frequency components, measured in hertz (cycles per second). For example, a modem with a bandwidth of 56 kilobits per second (Kbps) can transmit a maximum of about 56,000 bits of digital data in one second. The human voice, which produces analog sound waves, has a typical bandwidth of three kilohertz between the highest and lowest frequency sounds it can generate.

Banerjea \'ba-nor-je\. Sir Surendranath (b. Nov. 10, 1848, Calcutta, India — d. Aug. 6, 1925, Barrackpore, near Calcutta) Indian statesman, one of the founders of modern India. As a young man, he attempted unsuccessfully to serve in the Indian Civil Service, at the time virtually closed to ethnic Indians. He then became a teacher and founded a college in Calcutta (now Kolkata), which was later named for him. Banerjea attempted to bring Hindus and Muslims together for political action, and for 40 years he put forward a nationalist viewpoint in his newspaper, The Bengalee. Twice elected president of the Indian National Congress, he advocated for an Indian constitution on the Canadian model. He was elected in 1913 to two legislative councils and later was knighted (1921); in 1924 he was defeated by an independence candidate, whereupon he retired to write his autobiography, A Nation in the Making (1925).

Banff National Park Park, southwestern Alberta, Canada. Established as a natural reserve in 1885 and as Canada's first national park in 1887, it lies on the eastern slopes of the Rocky Mountains and includes mineral springs, ice fields, and glacial lakes, including Lake Louise. It has been greatly expanded to its present area of 2,564 sq mi (6,641 sq km). Banff is famed for its spectacular beauty, and visitors are so numerous that it is now more a recreation than a conservation area. In 1984 it was designated part of the Canadian Rocky Mountain Parks UNESCO World Heritage site.

Bangalore Vbaq-g3-,lor\ City (pop., 2001: city, 4,301,326; metro, area, 5,701,446), capital of Karnataka state, southern India. It is a cultural meeting place for speakers of the Kannada, Telugu, and Tamil languages.

Founded in the 16th century, it became a fief of the Indian ruler Hyder Ali c. 1760 but was later taken by the British. It was the headquarters of the British administration 1831-81, when it was restored to the raja of Mysore (now Karnataka). Today, it is one of India’s largest cities and an industrial and educational centre.

Banghdzl \ban-'ga-ze\ or Benghazi \ben-'ga-ze\ Coastal city (pop., 1995 est.: 650,000), northeastern Libya. Located on the Gulf of Sidra, it is Libya’s second largest city and was once its capital. Founded by Greeks as Hesperides, it received from Ptolemy III the additional name Berenice in honour of his wife. After the 3rd century ad it superseded Cyrene and Barce as the chief city of the region. After its importance waned, it remained a small town until it was extensively developed during the Italian occupation of Libya (1912-42). In World War II it suffered considerable damage before being captured by the British in 1942. It is now an administrative and commercial centre and the site of one of the world’s largest desalinization plants.

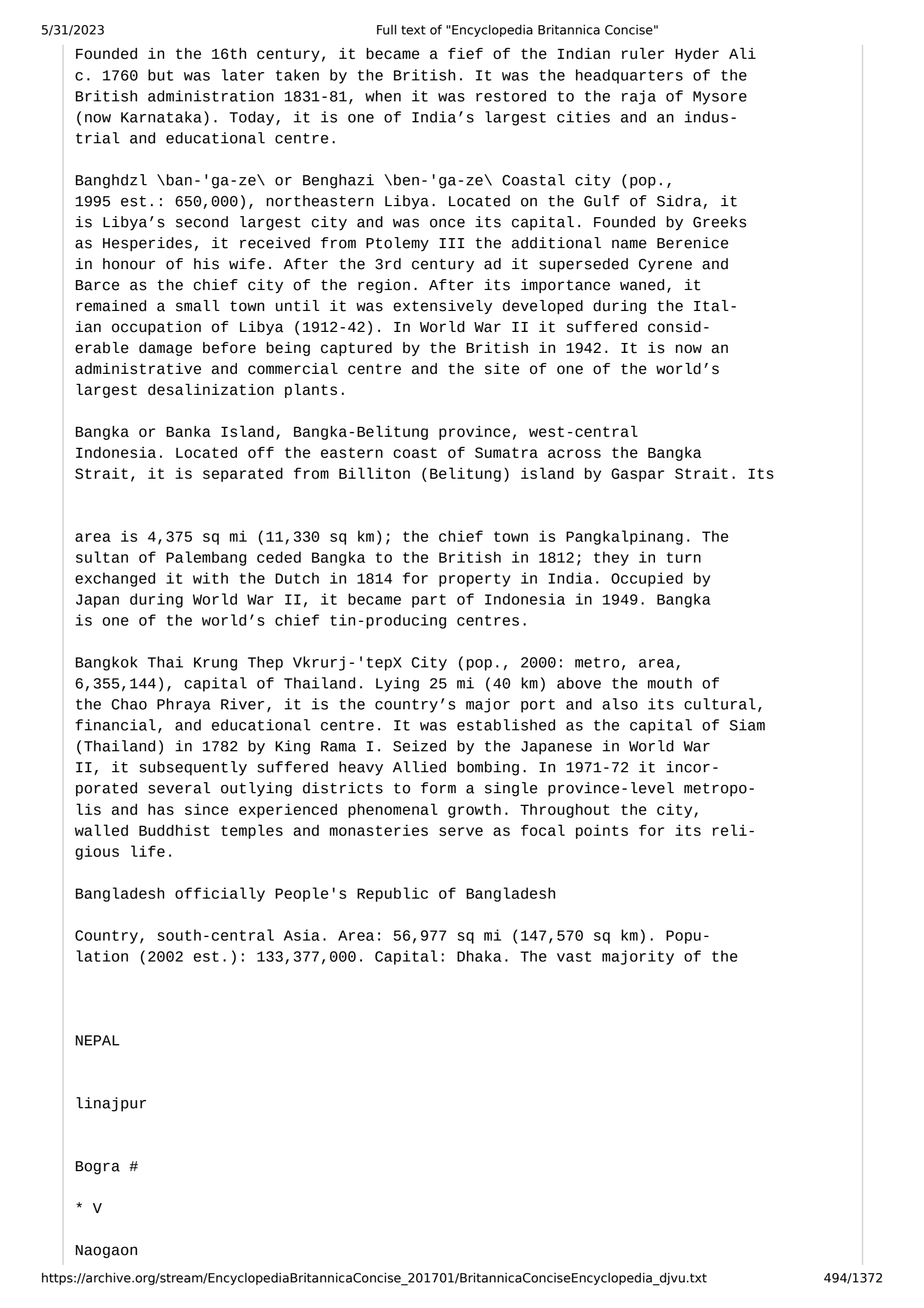
Bangka or Banka Island, Bangka-Belitung province, west-central Indonesia. Located off the eastern coast of Sumatra across the Bangka Strait, it is separated from Billiton (Belitung) island by Gaspar Strait. Its

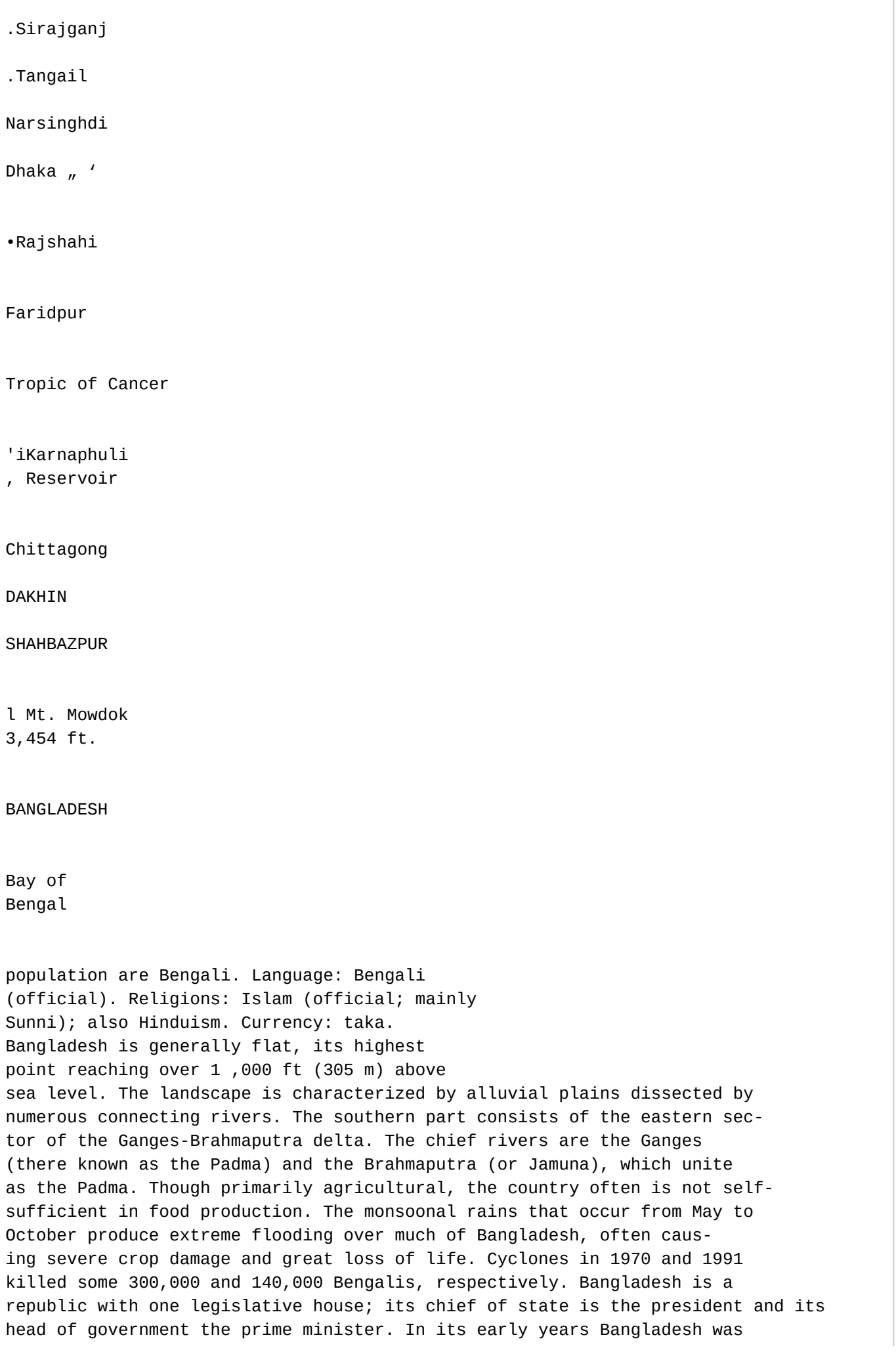
area is 4,375 sq mi (11,330 sq km); the chief town is Pangkalpinang. The sultan of Palembang ceded Bangka to the British in 1812; they in turn exchanged it with the Dutch in 1814 for property in India. Occupied by Japan during World War II, it became part of Indonesia in 1949. Bangka is one of the world’s chief tin-producing centres.

Bangkok Thai Krung Thep Vkrurj-'tepX City (pop., 2000: metro, area, 6,355,144), capital of Thailand. Lying 25 mi (40 km) above the mouth of the Chao Phraya River, it is the country’s major port and also its cultural, financial, and educational centre. It was established as the capital of Siam (Thailand) in 1782 by King Rama I. Seized by the Japanese in World War II, it subsequently suffered heavy Allied bombing. In 1971-72 it incorporated several outlying districts to form a single province-level metropolis and has since experienced phenomenal growth. Throughout the city, walled Buddhist temples and monasteries serve as focal points for its religious life.

Bangladesh officially People's Republic of Bangladesh

Country, south-central Asia. Area: 56,977 sq mi (147,570 sq km). Population (2002 est.): 133,377,000. Capital: Dhaka. The vast majority of the





population are Bengali. Language: Bengali (official). Religions: Islam (official; mainly Sunni); also Hinduism. Currency: taka.

Bangladesh is generally flat, its highest point reaching over 1 ,000 ft (305 m) above sea level. The landscape is characterized by alluvial plains dissected by numerous connecting rivers. The southern part consists of the eastern sector of the Ganges-Brahmaputra delta. The chief rivers are the Ganges (there known as the Padma) and the Brahmaputra (or Jamuna), which unite as the Padma. Though primarily agricultural, the country often is not self-sufficient in food production. The monsoonal rains that occur from May to October produce extreme flooding over much of Bangladesh, often causing severe crop damage and great loss of life. Cyclones in 1970 and 1991 killed some 300,000 and 140,000 Bengalis, respectively. Bangladesh is a republic with one legislative house; its chief of state is the president and its head of government the prime minister. In its early years Bangladesh was

known as Bengal. When the British left the subcontinent in 1947, the area that was East Bengal became the part of Pakistan called East Pakistan. Bengali nationalist sentiment increased after the creation of an independent Pakistan. In 1971 violence erupted; some one million Bengalis were killed, and millions more fled to India, which finally entered the war on the side of the Bengalis, ensuring West Pakistan's defeat. East Pakistan became the independent country of Bangladesh. Little of the devastation caused by the war has been repaired, and political instability, including the assassination of two presidents, has continued.

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Bangor Town (pop., 1991: 52,437), seat of North Down district. Northern Ireland. It lies on the southern shore of Belfast Lough, 12 mi (19 km) northeast of Belfast. St. Comgall founded a monastery at Bangor c. 555, which became a celebrated seat of learning. The town was sacked by the Danes in the 9th century; it was partially rebuilt by St. Malachy in the 12th century. It is now a seaside resort.

Bangui Vbai]-ge\ City (pop., 1995: 553,000), capital of the Central African Republic. A major port on the Ubangi River, it is connected by an extended 1,100-mi (1,800-km) river and rail transport system with the Congolese cities of Pointe-Noire and Brazzaville. Chiefly a commercial and administrative centre, Bangui is also the site of a university and research institutes.

Bangweulu V.baq-gwa-'u-lliV Lake Lake, northern Zambia. Located southeast of Lake Mweru and southwest of Lake Tanganyika at an elevation of 3,740 ft (1,140 m), it is about 45 mi (72 km) long and, with its adjacent swamps, covers an area of 3,800 sq mi (9,840 sq km). Its outlet is the Luapula, a headstream of the Congo. It has three inhabited islands. David Livingstone, the first European to visit the lake, died there in 1873.

Banja Luka \'ban-ya-Tu-ka\ City (pop., 1997 est.: 160,000), northeastern Bosnia and Herzegovina. It was an important military centre under the Turks and the seat (1583-1639) of the Bosnian territory governed by a pasha. A battlefield between the Austrians and Turks in the 16th- 18th centuries, it played an important part in the 19th-century Bosnian uprisings against Turkey as well as in the revolts of the Serbs. It was a hub of resistance in the Axis-dominated country of Croatia during World War II. In 1992 it became the capital of the autonomous Serbian Republic of Bosnia and Herzegovina. It was the site of much fighting during the Bosnian CONFLICT.

banjo Plucked stringed musical instrument of African origin. It has a tambourine-like body, four or five strings, and a long fretted neck. The fifth string (if present) is pegged at the fifth fret and acts primarily as a drone plucked by the thumb. In its original form, the banjo had only four strings and lacked frets. Slaves introduced the instrument to the U.S.,

where it was popularized in 19th-century minstrel shows and thence exported to Europe. It has been an important American folk instrument, especially in bluegrass, and it was used in early jazz.

Banjul \'ban-Jul\ formerly (1816-1973) Bathurst Seaport (pop., 1993: urban agglomeration, 270,540), capital of The Gambia. Located on the Island of St. Mary in the Gambia River, it is the country's largest city. Founded by the British in 1816 to suppress the slave trade, it subsequently became the capital of the British colony of Gambia. With The Gambia's independence in 1965, it became the national capital. Tourism is of increasing importance, and Banjul serves as a transportation centre with connections to the interior and to Senegal.

bank Institution that deals in money and its substitutes and provides other financial services. Banks accept deposits and make loans and derive a profit from the difference in the interest paid to lenders (depositors) and charged to borrowers, respectively. They also profit from fees charged for services. The three major classes of banks are commercial banks, investment banks, and central banks. Banking depends entirely on public confidence in the system's soundness; no bank could pay all its depositors should they simultaneously demand cash, as may happen in a panic. See also credit union; Federal Reserve System; savings and loan association; savings bank.

Bank of Canada Canada's central bank, established under the Bank of Canada Act (1934). It was founded during the Great Depression to regulate credit and currency. The Bank acts as the Canadian government's fiscal agent and has the sole right to issue paper money. It is directed by the Canadian Ministry of Finance; all profits go to the Receiver General of Canada.

Bank of England Central bank of Britain, headquartered in London. Incorporated by act of Parliament in 1694, it soon became the largest and most prestigious financial institution in England. It did not assume the responsibilities of a central bank until the 19th century, and it was privately owned until 1946, when it was nationalized.

Bank of the United States Bank chartered in 1791 by the U.S. Congress. It was conceived by Alexander Hamilton to pay off the country's debts from the American Revolution and to provide a stable currency. Its establishment, opposed by Thomas Jefferson, was marked by extended debate over its constitutionality and contributed significantly to the evolution of pro- and anti-bank factions into the first U.S. political parties, the Federalist Party and the Democratic-Republican Party. The national bank played the unexpected but beneficial role of preventing private state banks from overextending credit, a restriction that some nevertheless considered an affront to states' rights. Meanwhile, agrarian populists regarded the bank as an institution of privilege and wealth and the enemy of democracy and the interests of the common people. Antagonism over the bank issue grew so heated that its charter could not be renewed in 1811. Criticism of the bank reached its height during the administration of Pres. Andrew Jackson, who led anti-bank forces in the long struggle known as the Bank War. The bank's charter expired in 1836. Its reorganization as the Bank of the United States of Pennsylvania ended its regulation of private banks.

bank rate See discount rate

Bank War Controversy in the 1830s over the existence of the Bank of the United States, at that time the only national banking institution. The first Bank of the United States, chartered in 1791 over the objections of Thomas Jefferson, ceased in 1811 when Jeffersonian (Democratic) Republicans refused to pass a new federal charter. In 1816 the second Bank of the United States was created, with a 20-year federal charter. In 1829 and again in 1830 Pres. Andrew Jackson made clear his constitutional objections to and personal antagonism toward the bank. He believed it concentrated too much economic power in the hands of a small moneyed elite beyond the public's control. Its president, Nicholas Biddle, with the support of Henry Clay and Daniel Webster, applied for a new charter in 1832, four years before the old charter was due to expire, thus ensuring that the bank would be an issue in the 1832 presidential election. Jackson vetoed the recharter bill and won the ensuing election, interpreting his victory as a mandate to destroy the bank. He forbade the deposit in the bank of government funds; Biddle retaliated by calling in loans, which precipitated a credit crisis. Denied renewal of its federal charter, the bank secured a Pennsylvania charter in 1836. Faulty investment decisions forced it to close in 1841.

Banka See Bangka

Bankhead, Tallulah (Brockman) (b. Jan. 31, 1902, Huntsville, Ala., U.S. — d. Dec. 12, 1968, New York, N.Y.) U.S. film and stage actress. Born to a prestigious family (her father became a prominent congressman), she made her Broadway debut in 1918 and achieved fame on the London stage in The Dancer (1923). Her vivid presence and throaty voice contributed to her singular performances in the hit plays The Little Foxes (1939), The Skin of Our Teeth (1942), and Private Lives (1946). She made films such as A Woman's Law (1928) and Alfred Hitchcock's Lifeboat (1944) but remained primarily a stage performer. Her final stage appearance was in The Milk Train Doesn 't Stop Here Anymore (1964).

bankruptcy Status of a debtor who has been declared by judicial process to be unable to pay his or her debts. It also refers to the legal process involved: the administration of an insolvent debtor's property by the court for the benefit of the debtor's creditors. Filing by a debtor is called voluntary bankruptcy; involuntary bankruptcy is declared by the court upon petition by a creditor. The U.S. Bankruptcy Code makes four types of relief available to bankrupt individuals or corporations: liquidation (under Chapter 7), reorganization (Chapter 11), debt adjustment for a family farmer (Chapter 12), and debt adjustment for an individual with a regular income (Chapter 13). Municipalities may file under Chapter 9. Generally, not all debts are paid in a bankruptcy. The court determines which debts are to be repaid, and the debtor is typically granted a discharge of the rest. See also insolvency.

Banks Island Island, Northwest Territories, Canada. The westernmost island in the Canadian Arctic Archipelago, it lies northwest of Victoria Island and is separated from the mainland by Amundsen Gulf. About 250 mi (400 km) long, it has an area of 27,038 sq mi (70,028 sq km). First sighted by Sir William Parry's expedition in 1820, it was named for the naturalist Joseph Banks.

Banks Peninsula Peninsula, South Island, New Zealand, extending about 35 mi (55 km) into the Pacific Ocean. Originally an island formed by two contiguous volcanic cones, the peninsula was visited in 1770 by

Capt. James Cook, who named it for Joseph Banks. Christchurch is situated at its base.

Banks, Ernie in full Ernest Banks (b. Jan. 31, 1931, Dallas, Tex., U.S.) American baseball player. In 1950 Banks was signed by the Kan-

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sas City Monarchs, one of the top teams in the Negro leagues. After one season with the Monarchs, Banks spent two years in the U.S. Army. He spent only a short time in the Negro leagues after his discharge from the service, as he was signed by the Chicago Cubs in 1953. Banks soon established himself as one of the National League's leading power hitters, his career batting totals were 512 home runs and 1,636 runs batted in, with more than 40 home runs in each of five seasons. He was elected to the Baseball Hall of Fame in 1977, his first year of eligibility.

Banks, Russell (b. March 28, 1940, Newton, Mass., U.S.) U.S. novelist. Banks was associated in the 1960s with Lillabulero Press and has taught at various colleges and universities. He attracted wide attention with Continental Drift (1985), inspired by a stint in Jamaica; his later novels, which, like his earlier works, often portray characters trapped by economic and social forces they do not understand, include Affliction (1989; film, 1998), The Sweet Hereafter (1991; film, 1997), and Cloudsplitter (1998), a historical novel about the abolitionist John Brown.

Banks, Sir Joseph (b. Feb. 13, 1743, London, Eng. — d. June 19, 1820, Isleworth, London) British explorer and naturalist. After studying at Oxford, Banks inherited a fortune that allowed him to travel extensively, collecting plant and natural history specimens. He outfitted and accompanied James Cook's voyage around the world (1768-71). Particularly interested in economic plants and their introduction from one country to another, he was the first to suggest the identity of the wheat rust and barberry fungus (1805); he was also the first to show that marsupial mammals are more primitive than placental mammals. He served as president of the Royal Society from 1778 to 1820, and, as unofficial director of Kew Gardens, he transformed it into a major botanical institution. His herbarium, one of the most important in existence, and his library, a major collection of works on natural history, are now at the British Museum.

Barm, River River, Northern Ireland. The Upper Bann flows northwest 25 mi (40 km) into Lough Neagh, while the Lower Bann flows north out of the lake 33 mi (53 km) into the Atlantic Ocean.

Banna' \ban-'na\, Hasan al- (b. 1906, Egypt — d. February 1949, Cairo) Egyptian political and religious leader. He began teaching Arabic at a primary school in Ismailia in 1927. In 1928 he established the Muslim Brotherhood, which aimed at rejuvenating Islam and Egyptian society and expelling the British from Egypt. By 1940 it was attracting students, civil servants, and urban labourers to its ranks. He tried to maintain an alliance with the Egyptian government, but many members saw the gov-

ernment as betraying Egyptian nationalism, and after the war, members were implicated in several political assassinations, including that of Prime Minister al-Nuqrashl in 1948. Hasan al-Banna 5 was assassinated with government involvement the next year.

Banneker, Benjamin (b. Nov. 9, 1731, Ellicott's Mills, Md. — d. Oct. 25, 1806, Baltimore, Md., U.S.) American astronomer, compiler of almanacs, and inventor. A free black who owned a farm near Baltimore, Banneker was largely self-educated in astronomy and mathematics. In 1761 he attracted attention by building a wooden clock that kept precise time. He began astronomical calculations about 1773, accurately predicted a solar eclipse in 1789, and published annually from 1791 to 1802 the Pennsylvania, Delaware, Maryland, and Virginia Almanac and Ephemeris. (He sent an early copy of the almanac to Thomas Jefferson to counter a contention that blacks were intellectually inferior.) In 1790 he was appointed to the commission that surveyed the site for Washington, D.C. He also wrote essays denouncing slavery and war.

Banner system Military organization used by the Manchu tribes of Manchuria (now northeastern China) to conquer and control China in the 17th century. The system was developed by the Manchu leader Nurhachi, who in 1601 organized his warriors into four companies, each known for its banner of a distinguishing colour. More Banners (as the companies were known) were soon established, and, as the Manchus began to conquer their Chinese and Mongol neighbours, they organized their captives into similar companies. With these troops the Manchus conquered China and established the Qing dynasty in 1644. Over time, the Banners' fighting qualities deteriorated, until by the end of the 19th century the system had become largely ineffective.

Bannister, Sir Roger (Gilbert) (b. March 23, 1929, Harrow, Middlesex, Eng.) British runner. He attended the University of Oxford before earning a medical degree. In 1954 he became the first person to run a mile in less than four minutes (3 minutes 59.4 seconds). Many authorities had

previously regarded the four-minute mile "barrier" as unbreakable. A neurologist, he wrote papers on the physiology of exercise, and he is said to have achieved his speed through scientific training methods.

Bannockburn, Battle of (June 23-24, 1314) Decisive battle in Scottish history, at which the Scots under Robert the Bruce (later Robert I) defeated the English under Edward II. The Scots were outnumbered three to one by the English soldiers, but they triumphed through masterly use of terrain, forcing the English onto a cramped, marshy battlefield with little room to maneuver. The English forces were put to flight, and many were slaughtered by the pursuing Scots. The victory cleared the last English troops from Scotland and secured Scottish independence, confirming Robert as king of the Scots.

Banpo \'ban-'po\ or Pan-p'o Site of a Neolithic village located on the Wei River in China, dating to the earlier part of the Yangshao culture, 5000-4000 bc. A huge number of artifacts have been uncovered, including 8,000 stone and bone tools, pottery fragments, and clay figurines. The main cultivated crop was foxtail millet; the diet was supplemented through hunting and gathering. Pigs and dogs were domesticated, and evidence of hemp and silkworm cultivation point to textile manufacture. Some 250 graves have been excavated. See also Neolithic Period.

Banque de France \'ba n k-d3-'fra n s\ National bank of France, created in 1800 to restore confidence in the French banking system after the financial upheavals of the revolutionary period. Napoleon was one of its founding shareholders. The bank has primary responsibility for formulating and implementing credit and monetary policies in France and for the orderly functioning of the banking system. It also has the exclusive privilege of issuing currency. See also central bank.

Bantam Former city and sultanate, Java. It was located at the western end of Java between the Java Sea and the Indian Ocean. In the early 16th century it became a powerful Muslim sultanate, which extended its control over parts of Sumatra and Borneo. Invaded by the Dutch, Portuguese, and British, it ultimately recognized Dutch sovereignty in 1684. The city was Java’s most important port for the European spice trade until its harbour silted up in the late 18th century. It suffered severely from the eruption of Krakatoa in 1883.

Banting, Sir Frederick Grant (b. Nov. 14, 1891, Alliston, Ont., Can. — d. Feb. 21, 1941, Nfd.) Canadian physician. He taught at the University of Toronto from 1923. With Charles Best, he was the first to obtain a pancreatic extract of insulin (1921), which, in the laboratory of J.J.R. Macleod, they isolated in a form effective against diabetes. Banting and Macleod received a 1923 Nobel Prize for the discovery of insulin; Banting voluntarily shared his portion of the prize with Best.

Bantu languages Group of some 500 languages belonging to the Benue-Congo language branch of the Niger-Congo language family. They are spoken by more than 200 million people in a very large area, including most of Africa from southern Cameroon eastward to Kenya and southward to the southernmost tip of the continent. Twelve Bantu languages, including Rundi (Kirundi), Rwanda (Kinyarwanda), Shona, Zulu, and Xhosa, are spoken by more than 5 million people.

Bantu peoples Speakers of the close to 500 distinct Bantu languages, numbering more than 200 million and occupying almost the entire southern projection of Africa. The classification is primarily linguistic, for the cultural patterns of Bantu speakers are extremely diverse. Included in the group are the Bemba, Bena, Chaga, Chewa, Embu, Fang, Ganda, Gusii, Hehe, Herero, Hutu, Kagwe, Kikuyu, Luba, Luhya, Lunda, Makonde, Meru, Nayamwezi, Ndebele, Nkole, Nyakyusa, Nyoro, Pedi, Shona, Sotho, Swazi, Tsonga, Tswana, Tutsi, Venda, Xhosa, Yao, Zaramo, and Zulu.

banyan Unusually shaped tree {Ficus benghalensis, or F. indica) of the fig genus in the mulberry family, native to tropical Asia. Aerial roots that develop from its branches descend and take root in the soil to become new trunks. The banyan reaches a height of up to 100 ft (30 m) and spreads laterally indefinitely. One tree may in time assume the appearance of a very dense thicket as a result of the tangle of roots and trunks.

Banzer Suarez Vban-ser-'swa-res\, Hugo (b. July 10, 1926, Santa Cruz, Bol. — d. May 5, 2002, Santa Cruz) Soldier and president of Bolivia (1971-78, 1997-2001). After an education in Bolivian and U.S. Army training schools, Banzer served in various government posts. He became president after participating in the overthrow of two Bolivian governments in 1970 and 1971. A conservative, he encouraged foreign investment and

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severely repressed all opposition. His restrictions of union activities and constitutional liberties led to opposition by labour, the clergy, peasants, and students. A 1978 coup d'etat overthrew him, but he was democratically elected in 1997. He resigned in 2001.

Bao Dai \'bau-'dl\ orig. Nguyen Vinh Thuy (b. Oct. 22, 1913, Vietnam — d. Aug. 1, 1997, Paris, France) Last reigning emperor of Vietnam (r. 1926-45, 1949-55). He was educated in France and in 1926 succeeded to a throne that was dominated by the French. Retained as a powerless ruler under the Japanese during World War II, he fled the country after the Viet Minh drove the Japanese out. In 1949 the French, having agreed to the principle of an independent Vietnam, invited him to return as sovereign. He did, but he accomplished little and retired to France in 1955 when a national referendum called for the country to become a republic.

baobab \'bau-,bab\ Tree (Adansonia digitata) of the bombax family (Bombacaceae), native to Africa. The barrel-like trunk may reach a diameter of 30 ft (9 m) and a height of 60 ft (18 m). The large, gourdlike, woody fruit contains a tasty pulp. A strong fibre from the bark is used locally for rope and cloth. The trunks are often excavated to serve as water reserves or temporary shelters. For its extraordinary shape the baobab is grown as a curiosity in areas of warm climate, such as Florida. A related species, A. gregorii, occurs in Australia, where it is also called a bottle tree.

baojia \'bau-'je-9\ or pao-chia Chinese village militia system created by Wang Anshi as part of his reforms of 1069-76. Units of 10 families were regularly trained and supplied with arms, thereby reducing the government's dependence on mercenaries. Members were mutually responsible for each other. The system was resurrected in the 19th century to help put down the Taiping Rebellion and was imitated by both the Nationalist Party and the Chinese Communist Party in the 20th century.

baptism In Christianity, the sacrament of admission to the church, symbolized by the pouring or sprinkling of water on the head or by immersion in water. The ceremony is usually accompanied by the words "I baptize you in the name of the Father, and of the Son, and of the Holy Spirit." Indeed, Christians believe that after his resurrection, Jesus appeared to his disciples and commanded them to baptize in the name of the Father, Son, and Holy Spirit. In the teaching of St. Paul, it signifies the wiping away of past sins and the rebirth of the individual into a new life. Judaism practiced ritual purification by immersion, and the Gospels report that John the Baptist baptized Jesus. Baptism was an important ritual in the early church by the 1 st century, and infant baptism appeared by the 3rd century. Roman Catholic, Orthodox, and most Protestant churches practice infant baptism. The Anabaptist reformers insisted on adult baptism after a confession of faith; modern Baptists and the Disciples of Christ also practice adult baptism.

Baptist Member of a group of Protestant Christians who hold that only adult believers should be baptized and that it must be done by immersion. During the 17th century two groups of Baptists emerged in England: General Baptists, who held that Christ's atonement applied to all persons, and Particular Baptists, who believed it was only for the elect. Baptist origins in the American colonies can be traced to Roger Williams, who established a Baptist church in Providence, R.I., in 1639. Baptist growth in the U.S. was spurred by the Great Awakening in the mid- 18th century. The 1814 General Convention showed divisions among U.S. Baptists over slavery; a formal split occurred when the Southern Baptist Convention was organized in 1845 and was confirmed when the Northern (American) Baptist Convention was organized in 1907. African-American Baptist churches provided leadership in the 1960s civil rights movement, notably through the work of Martin Luther King. Baptist belief emphasizes the authority of local congregations in matters of faith and practice; worship is characterized by extemporaneous prayer and hymn-singing as well as by the exposition of scripture in sermons.

baptistery or baptistry Domed hall or chapel, adjacent to or part of a church, for the administration of baptism. By the 4th century, the baptistery had assumed an eight-sided shape (eight in Christian numerology being the symbol for a new life), as had the baptismal font within. The font itself was set beneath a dome-shaped baldachin and encircled by columns and an ambulatory (aisle), features first used by the Byzantines. See photograph opposite.

Baqqarah See Baggara

bar association Group of lawyers organized primarily to deal with issues affecting the legal profession. In general, they are concerned with furthering the interests of lawyers through advocating reforms in the legal system, sponsoring research projects, and regulating professional standards. Bar associations sometimes administer the examinations required for admission to practice law. The largest U.S. bar association is the American Bar Assn.

bar code Printed series of parallel bars of varying width used for entering data into a computer system, typically for identifying the object on which the code appears. The width and spacing of the bars represent binary information that can be read by an optical (laser) scanner that is part of a computer system. The coding is used in many different areas of manufacturing and marketing, including inventory control and tracking systems. The bar codes printed on supermarket and other retail merchandise are those of the Universal Product Code (UPC).

bar graph See histogram

Bar Kokhba \,bar-'k6k-ba\ orig. Simeon bar Kosba (d. ad 135) Leader of an unsuccessful Jewish revolt against Roman rule in Palestine. In 131 Hadrian forbade circumcision and built a temple to Jupiter on the ruins of the Temple of Jerusalem. The Jews rebelled in 132, led by Simeon bar Kosba, who, according to one story, was hailed as a messiah by Akiba ben Joseph. He was called Bar Kokhba ("Son of the Star"), a messianic allusion drawn from the book of Numbers. His army captured Aelia and inflicted heavy casualties, but Hadrian visited the battlefield and summoned reinforcements, and the Romans retook Jerusalem. Bar Kokhba

was killed at Betar in 135, and the remnant of the Jewish army was soon crushed, with total Jewish losses, according to the 3rd-century Roman historian Dio Cassius, numbering 580,000. Surviving Jews were exiled and barred from Jerusalem.

Bar Mitzvah X.bar-'mits-voX Jewish ritual celebrating a boy’s 13th birthday and his entry into the community of Judaism. It usually takes place during a Sabbath service, when the boy reads from the Torah and may give a discourse on the text. The service is often followed by a festive Kiddush and a family dinner on the same day or next day. Reform Judaism substituted confirmation of boys and girls for the Bar Mitzvah celebration after 1810, but many congregations restored the Bar Mitzvah in the 20th century. A separate ceremony for girls. Bat Mitzvah, has been instituted in Reform and Conservative Judaism.

Bara Vbar-o\, Theda orig. Theodosia Goodman (b. July 20, 1885?, Cincinnati, Ohio, U.S. — d. April 7, 1955, Los Angeles, Calif.) U.S. film actress. She had a brief stage career before going to Hollywood. Her first major picture, A Fool There Was (1915), was accompanied by a publicity campaign, billing her as the daughter of a Middle Eastern potentate, that made her an instant success. Establishing a sultry, exotic persona, she became the prototype of the screen “vamp.” She made more than 40 films within a few years, but her popularity soon declined, and she retired in the 1920s.

Barabbas \bo-'ra-b3s\ In the New Testament, a prisoner or criminal freed to please the mob before the crucifixion of Jesus. Described as a thief or an insurrectionist, Barabbas is mentioned in all four Gospels. Following the custom of setting free one prisoner chosen by popular demand before Passover, Pontius Pilate suggested pardoning Jesus, but the crowd protested and demanded the release of Barabbas. Pilate gave in and sent Jesus to his death.

Barada \'bar-3-da\ River ancient Chrysorrhoas River, western Syria. It flows about 45 mi (72 km) from the Anti- Lebanon Mountains past Damascus. Throughout history, channels have been cut at different levels parallel to the main branch of the river to divert its flow. The channels (of Nabataean, Aramaean, and, especially, Roman origin) fan out as they reach Damascus, irrigating a large area. This system created the site of Damascus, an artificial oasis of extreme fertility.

Barak River See Surma River

Battistero (baptistery) San. Giovanni, Florence, begun 7th century

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Baraka Vba-'ra-ksX, (Imamu) Amiri orig. (Everett) LeRoi Jones

(b. Oct. 7, 1934, Newark, N.J., U.S.) U.S. playwright, poet, and activist. After graduating from Howard University and serving in the U.S. Air Force, he joined the Beat movement and in 1961 published his first major poetry collection. His play Dutchman (1964), produced off-Broadway, explored the suppressed hostility of U.S. blacks toward the dominant white culture. After the assassination of Malcolm X in 1965, Baraka became involved in black nationalism and founded the Black Arts Repertory Theatre in Harlem. In 1974 he adopted a Marxist-Leninist philosophy. He was appointed Poet Laureate of New Jersey in 2002.

barangay V.bar-on-'gU Type of early Filipino settlement. The term was derived from balangay, the sailboats that brought Malay settlers to the Philippines from Borneo. Each boat carried a family group that established a village. These villages, which sometimes grew to include 30-100 families, remained isolated from one another; the fact that no larger political grouping emerged (except on Mindanao) facilitated the 16th-century Spanish conquest. The Spanish retained the barangay as a unit of local administration.

Barataria V.bar-s-'tar-e-oV Bay Inlet of the Gulf of Mexico, southeastern Louisiana, U.S. The bay is about 15 mi (24 km) long and 12 mi (19 km) wide, and its entrance is a narrow channel, navigable through connecting waterways into the Gulf Intracoastal Waterway system. The area is noted for its shrimp industry and natural-gas and oil wells. Jean Laffite and his brother organized a colony of pirates around its coast in 1 810—14, and it is sometimes called Laffite Country.

Barbados \bar-'ba-dos\ Island country. West Indies. The most easterly of the Caribbean islands, it lies about 100 mi (160 km) east of Saint Vincent and the Grenadines. Area: 166 sq mi (430 sq km). Population (2005 est.):

North

Point

CARIBBEAN \\

Speightstown %

ATLANTIC

OCEAN

SEA

Westmoreland *
Holetown

■Mthillaby

*Hillcrest

^Bennetts

Prospect Jackson

Bridgetown

Carlisle \

Bay < -x

Thicket)

Marchfield
* CJjamocks

Ragged

Point

BARBADOS

Of'sf/ns\ 0istins
Bay — '

South

Point

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270,000. Capital: Bridgetown. More than nine-tenths of the population is of African ancestry. Language: English (official). Religion: Christianity (mostly Protestant).

Currency: Barbados dollar. Largely cov-

ered by a layer of coral, Barbados is low and flat except in its north-central part; its highest point is Mount Hillaby, at 1,115 ft (340 m). There is little surface water. The island is almost encircled by coral reefs. Bridgetown is its only seaport. The economy is based on tourism and sugar, while the offshore financial sector is growing. Barbados is a constitutional monarchy with two legislative houses; its chief of state is the British monarch, represented by a governor-general, and the head of government is the prime minister. The island was probably inhabited originally by Arawak and later by Carib Indians. Spaniards may have landed by 1518, and by 1536 they had apparently wiped out the Indian population. Barbados was settled

by the English in the 1620s. Slaves were brought in to work the sugar plantations, which were especially prosperous in the 17th— 18th century. The British Empire abolished slavery in 1834, and all the Barbados slaves were freed by 1838. In 1958 Barbados joined the West Indies Federation. When the latter dissolved in 1962, Barbados sought independence from Britain, which it gained in 1966.

Barbara, Saint (d. 200; feast day December 4) Early Christian martyr and patroness of artillerymen. She was the daughter of a pagan, Dioscorus, who kept her guarded to protect her beauty and virginity. When she converted to Christianity he became enraged and took her to the Roman prefect, who ordered her to be tortured and beheaded. Her father performed the execution himself, and on the way home he was struck by lightning and reduced to ashes. Barbara was a popular saint during the Middle Ages and was invoked for aid in thunderstorms. She was dropped from the church calendar in 1969.

Barbarossa \,bar-b9-'ra-s9\ orig. Khidr later Khayr al-DTn (d.

1546) Greek Turkish pirate and admiral in the service of the Ottoman Empire. He and his brother c Aruj, sons of a Turk from Lesbos, hated the Spanish and Portuguese for their attacks on North Africa and took up piracy on the Barbary Coast in hopes of seizing an African domain for themselves. When c Aruj was killed in 1518, Khidr took the title Khayr al-Dln. He offered allegiance to the Ottoman sultan and in return received military aid that enabled him to capture Algiers in 1529. Appointed admiral in chief of the Ottoman Empire (1533), he conquered all of Tunisia. Emperor Charles V captured Tunis in 1535, but Khayr al-Dln defeated his fleet at the Battle of Preveza (1538), securing the eastern Mediterranean for the Turks for 33 years. His red beard was the source of the epithet Barbarossa, used by Europeans.

Barbary Coast Mediterranean coastal region, North Africa. It extends from Egypt to the Atlantic Ocean. Once part of Roman Africa, the region was overrun by Vandals in the 5th century ad. Reconquered by the Eastern Roman Empire (Byzantine Empire) c. ad 533, it was overcome by Arabs during the 7th century and was eventually broken up into the independent Muslim polities known collectively as the Barbary states (Morocco, Algeria [Algiers], Tunisia [Tunis], and Libya [Tripoli]). For centuries the coast was notorious as a haven for pirates, who ravaged shipping and collected tribute from European states. After the U.S. war with Tripoli (see Tripolitan War), the U.S. expedition to Algiers (1815), and the bombardment of Algiers by the British (1816), the pirates ceased exacting tribute.

Barbary macaque Tailless, terrestrial monkey (Macaca sylvana) found in groups in Algeria and

Morocco and on the Rock of Gibraltar. It is about 24 in. (60 cm) long and has yellowish brown fur and a bald, pale pink face. Lacking a tail, this macaque has often been incorrectly called an ape. It is the only wild monkey in Europe and may have arrived in medieval times, taken westward during the Muslim Arab territorial expansion. According to legend, British dominion over Gibraltar will end when the Barbary macaque departs.

Barber, Red orig. Walter Lanier Barber (b. Feb. 17, 1908, Columbus, Miss., U.S. — d. Oct. 22, 1992, Tallahassee, Fla.) U.S. sports broadcaster. He became the radio and television announcer for the baseball games of the Cincinnati Reds (1934-39), Brooklyn Dodgers (1939-53), and New York Yankees (1954-66). He combined technical expertise with homespun comments; his signature exclamation was “Oh-ho, Doctor!” He provided weekly commentary on National Public Radio from 1981 and wrote two books on baseball and an autobiography.

Barber, Samuel (b. March 9, 1910, West Chester, Pa., U.S. — d. Jan. 23, 1981, New York, N.Y.) U.S. composer. He studied piano, voice, conducting, and composition at the Curtis Institute. After graduation in 1934, he devoted himself to composition. Barber’s style, frequently lyrical and neo-Romantic, proved highly attractive to the public. His works include the popular Adagio for Strings (1936), two Essays for Orchestra (1937, 1942), the opera Vanessa (1957, Pulitzer Prize), and a Piano Concerto (1962, Pulitzer Prize).

Barbary macaque (Macaca sylvana).

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barberry Any of the almost 500 species of thorny evergreen or deciduous shrubs constituting the genus Berberis. The genus is the largest and most important group in the family Berberidaceae, of the buttercup order. Most barberries are native to the northern temperate zone, particularly Asia. Barberry bushes have yel-

low wood and yellow flowers. The fruit of several species is made into jellies. Other members of the same family include heavenly bamboo (Nandina domestica), an indoor potted plant; mayapple (Podophyllum peltatum), a woodland wildflower;

Epimedium, a ground cover; and Oregon grape (Mahonia), a genus of broad-leaved evergreen shrubs.

American barberry (Berberis canadensis).

barbershop quartet Popular vocal ensemble consisting of four unaccompanied male voices. The voice parts are tenor, lead, baritone, and bass, with the lead normally singing the melody and the tenor harmonizing above. The emphasis is on close harmony, synchronization of word sounds, and variation of tempo, volume, diction, and phrasing. Barbershop apparently originated in the U.S. in the late 19th century, when American barbershops formed social and musical centres for neighbourhood men, though the term may derive from “barber’s music,” the British term for an extemporized performance by patrons waiting to be shaved and referring to a barber’s traditional role as a musician.

barbet \'bar-bot\ Any of about 75 s
itonidae) named for the bristles at the base of their stout, sharp bill. They are big-headed and short-tailed, 3.5-12 in. (9-30 cm) long, and greenish or brownish with splashes of bright colours or white. Barbets are found throughout Central America and in northern South America, in sub-Saharan Africa, and in South Asia. They all fly weakly, and they sit in treetops when not feeding on insects, lizards, birds’ eggs, fruits, and berries. They call loudly while jerking the head or tail. Maddeningly vocal or repetitious species are sometimes called brain-f

of tropical birds (family Cap-

Crimson-headed barbet (Cap/Yo bourcieri).

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birds.

Barbie in full Barbara Millicent Roberts A plastic doll, 11.5 in. (29 cm) tall, with the figure of an adult woman that was introduced in 1959 by Mattel, Inc., a southern California toy company. Ruth Handler, who cofounded Mattel with her husband, Elliot, spearheaded the introduction of the doll. Since the 1970s, Barbie has been criticized for materialism (amassing cars, houses, and clothes) and unrealistic body proportions. Yet many women who had played with the doll as girls credit Barbie with providing an alternative to restrictive 1950s gender roles. Today the doll has come to symbolize consumer capitalism and is a global brand, with key markets in Europe, Latin America, and Japan. Barbie never caught on in the Muslim world, however. In 1995 Saudi Arabia stopped its sale because it violated the Islamic dress code. Similar dolls, complete with hijabs (head coverings), were eventually marketed to Muslim girls.

Barbie, Klaus (b. Oct. 25, 1913, Bad Godesberg, Ger. — d. Sept. 25, 1991, Lyon, France) Nazi leader. As head of the Gestapo in Lyon, France (1942-44), he pursued members of the French Resistance and promoted the torture and execution of thousands of prisoners. After World War II he was seized by U.S. authorities in Germany, who recruited him for counterintelligence work (1947-51) and then moved him and his family to Bolivia. He lived there as a businessman from 1951 until he was extradited to France in 1983 to stand trial. Throughout his trial “the Butcher of Lyon” remained unrepentant and proud of his service to the Nazis. Held responsible for the death of some 4,000 persons and the deportation of some 7,500 others, he was sentenced to life imprisonment.

barbiturate \bar-'bi-cli3-r3t\ Any of a class of heterocyclic compounds based on the parent structure, uric acid, and used in medicine. They depress the central nervous system, acting particularly on certain parts of

the brain, though they tend to depress the functioning of all the body’s tissues. Long-acting barbiturates (e.g., barbital and phenobarbital) are used to treat epilepsy. Intermediate ones (e.g., amobarbital) are used to treat insomnia, short-acting ones (e.g., pentobarbital) to overcome difficulty in falling asleep (one aspect of insomnia), and ultra-short-acting ones (e.g., thiopental sodium) to induce unconsciousness in surgical patients before administration of other anesthetics. Prolonged use of barbiturates may lead to addiction. Sudden withdrawal can be fatal; addicts must be weaned from the drug under medical supervision. Overdoses can result in coma and even death; barbiturates are particularly dangerous, even at normal doses, when combined with alcoholic beverages.

Barbizon \,bar-b3- , zon\ school Group of 19th-century French landscape painters. They were part of a larger European movement toward naturalism that made a significant contribution to realism in French landscape painting. Led by Theodore Rousseau and Jean-Francois Millet, they attracted a large following of painters who came to live at Barbizon, a village near Paris; most notable of this group were Charles- Francois Daubigny, Narcisse-Virgile Diaz de la Pena, Jules Dupre, Charles-Emile Jacque, and Constant Troyon. Each had his own style, but all emphasized painting out-of-doors directly from nature, using a limited palette, and creating atmosphere or mood in their landscapes.

Barbosa \bar-'bo-s9\, Ruy (b. Nov. 5, 1849, Salvador, Bahia, Brazil — d. March 1, 1923, Petropolis) Brazilian orator, statesman, and jurist. Barbosa, an eloquent liberal, wrote the constitution for Brazil's newly formed republic in 1890 and held various posts, including minister of finance, in the provisional government that launched the republic. He became a senator in 1895, and in 1907 he led a delegation to the second of the Hague Conventions, where he gained international renown for his oratory and for his defense of the legal equality of rich and poor nations. He ran for president in 1910 on an antimilitary platform, and again in 1919, but lost both times.

Barbuda See Antigua and Barbuda

Barca, Pedro Calderon de la See Pedro Calderon de la Barca

Barcelona \bar-so-To-no\ Seaport city (pop., 2005 est.: 1,593,075), capital of Catalonia autonomous region, northeastern Spain. Spain's largest port and second largest city, it is the country's principal industrial and commercial centre, as well as a major cultural and educational centre. It is said to have been founded in the 3rd century bc by the Carthaginians or the Phoenicians, and it was later ruled by the Romans and Visigoths. It was captured by the Moors c. ad 715, but it was retaken by the Franks under Charlemagne in 801 and made the capital of the Spanish March (Catalonia). After Catalonia united with Aragon in 1137, Barcelona became a flourishing commercial centre and the rival of Italian ports. In the 19th century it was a cauldron for radical social movements and Catalan separatism. It was the loyalist capital in 1937-39 during the Spanish Civil War; its capture by Francisco Franco brought the collapse of Catalan resistance and Catalonia's reintegration into Spain. Modern Barcelona is known for its handsome architecture, including buildings by Antoni Gaudi. It hosted the 1992 Summer Olympic Games.

Barclay de Tolly Xbar-'kll-do-'to-leX, Mikhail (Bogdanovich), Prince (b. Dec. 13, 1761, Pamuskis, Poland-Lithuania — d. May 14, 1818, Insterburg, East Prussia) Russian field marshal prominent in the Napoleonic Wars. A member of a Scottish family that had settled in Livonia, Barclay entered the Russian army in 1786. In 1812 he took command of one of two Russian armies operating against Napoleon. His strategy of avoiding decisive action and retreating into Russia proved unpopular, and he was forced to resign his command. He took part in the invasion of France in 1814, and in 1815 he was commander in chief of the Russian army that invaded France after Napoleon's return from Elba.

Barcoo River See Cooper Creek

bard Celtic tribal poet-singer gifted in composing and reciting verses of eulogy and satire or of heroes and their deeds. The institution died out in Gaul but survived in Ireland, where bards have preserved a tradition of chanting poetic eulogy, and in Wales, where the bardic order was codified into distinct grades in the 10th century. Despite a decline in the late Middle Ages, the Welsh tradition is celebrated in the annual National Eisteddfod.

Bard College Private liberal arts college founded in 1860 in Annandale-on-Hudson, New York, U.S. It was founded by John Bard and

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Episcopal church leaders as St. Stevens, an Episcopal college for men. The name was changed to Bard College in 1934. Between 1928 and 1944 it served as Columbia University' s undergraduate school. It became coeducational in 1944. Its undergraduate curriculum includes courses in the social sciences, languages and literature, arts, and natural sciences and mathematics.

Bardeen, John (b. May 23, 1908, Madison, Wis., U.S. — d. Jan. 30, 1991, Boston, Mass.) U.S. physicist. He earned a Ph.D. in mathematical physics from Princeton University. He worked for the U.S. Naval Ordnance Laboratory during World War II, after which he worked for Bell Telephone Laboratories. His work there led to his sharing a 1956 Nobel Prize with William B. Shockley and Walter H. Brattain for the invention of the transistor. In 1972 he again shared a Nobel Prize, this time with Leon Cooper and J. Robert Schrieffer for developing the theory of superconductivity (1957); this theory (called the BCS theory, for Bardeen-Cooper-Schrieffer) is the basis for all later theoretical work in superconductivity. Bardeen was also the author of a theory explaining certain properties of SEMICONDUCTORS.

Bardesanes \,bar-d3-'sa-nez\ or Bardaisan \,bar-dl-'san\ (b. July 11, 154, Edessa, Syria — d. c. 222, Edessa) Syrian Gnostic Christian and speculative thinker. He converted to Christianity in 179 and became a missionary. He attacked the fatalism of the Greek philosophers and, showing the influence of Gnosticism, ascribed the creation of the world, the Devil, and evil to a hierarchy of gods rather than to the supreme God. His chief written work. The Dialogue of Destiny, is the oldest known example of Syriac literature. He is also remembered for his Syriac hymns.

Bardot \bar-'d6\, Brigitte (b. Sept. 28, 1934, Paris, France) French film actress. She was discovered by Roger Vadim when she appeared on a magazine cover at 15 and made her film debut in 1952. Vadim crafted her "sex kitten" image for his films And God Created Woman (1956) and The Night Heaven Fell (1958), which set box-office records and made her an international star. She displayed her acting ability in such films as The Truth (1960), Contempt (1963), and Viva Maria! (1965). An animal rights activist, she established an animal welfare organization in 1987.

Barenboim Vbar-on-.boinrf, Daniel (b. Nov. 15, 1942, Buenos Aires, Arg.) Argentine-born Israeli pianist and conductor. A prodigy, he made his debut at age eight. His family moved to Israel in 1952, and he first performed in the U.S. at Carnegie Hall in 1957. As a pianist he became known for his colourful interpretations of Classical and Romantic composers. He started conducting professionally in 1962 and led the English Chamber Orchestra (1964-75) and the Orchestre de Paris (1975-89). He became principal conductor of the Chicago Symphony Orchestra in 1991 and was appointed music director of the Berlin State Opera in 1992. He has been a prominent advocate for peace in the Middle East.

Barents Sea Outlying portion of the Arctic Ocean. Named for the Dutch

explorer Willem Barents, it is bounded by the Norwegian and northwestern Russian mainland (south), the Norwegian Sea and Svalbard (west), Franz Josef Land (north), and the Kara Sea and Novaya Zemlya (east). It is 800 mi (1,300 km) long and 650 mi (1,050 km) wide and covers 542,000 sq mi (1,405,000 sq km). Its average depth is 750 ft (229 m), with a maximum depth of 2,000 ft (600 m) in the major Bear Island Trench.

bargello \bar-'je-lo\ or Florentine canvas work Type of 17th-century embroidery, named for the upholstery of a set of Italian chairs at Florence’s Bargello Museum. It consists of a wavy zigzag pattern of flat vertical stitches laid parallel with the canvas weave, rather than crossing the intersections diagonally as in most canvas stitches, in gradating tones of the same colour or in contrasting colours. The characteristic stitch is called Florentine, cushion, Hungarian, or flame stitch (an allusion to the flamelike gradation of colour).

Bari Vba-r e\ ancient Barium Seaport city (pop., 2001 prelim.: 332,143), capital of Puglia, southeastern Italy. Evidence shows that the site may have been inhabited since 1500 bc. Under the Romans it became an important port. In the 9th century ad it was a Moorish stronghold, but it was taken by the Byzantines in 885. Peter the Hermit preached the First Crusade there in 1096. Razed by the Sicilians in 1156, it acquired new greatness in the 13th century under Frederick II. It became an independent duchy in the 14th century, passed to the Kingdom of Naples in 1558, and became part of the Kingdom of Italy in 1861.

barite Vbar-.flA or barytes \b3-'ri-tez\ or heavy spar Most common barium mineral, barium sulfate (BaS0 4). It commonly forms as platy

crystals (known as crested barite).

Barite is abundant in parts of Spain,

Germany, and the U.S. Commercially, ground barite is used in oil well and gas well drilling muds; in the preparation of barium compounds; as a filler for paper, cloth, and phonograph records; as a white pigment; and as an inert material in coloured paints.

baritone In vocal music, the most common category of male voice, between the bass and the tenor. Its range is approximately from the second A below middle C to the F above middle C. The term baritonus was first employed in 15th-century five- and six-voice part music; when four-part settings became standard, the baritone part was dropped, and natural baritones were forced to develop either their bass or tenor register. Instruments that play principally in the baritone register include the baritone saxophone and the baritone horn.

barium Vbar-e-snrf Chemical element, one of the alkaline earth metals, chemical symbol Ba, atomic number 56. It is very reactive and in compounds always has valence 2. In nature it is found chiefly as the minerals barite (barium sulfate) and witherite (barium carbonate). The element is

used in metallurgy, and its compounds are used in fireworks, petroleum mining, and radiology and as pigments and reagents. All soluble barium compounds are toxic. Barium sulfate, one of the most insoluble salts known, is given in a “barium meal” as a contrast medium for X-ray examination of the gastrointestinal tract.

bark In woody plants, tissues outside of the vascular cambium. The term is also used more popularly to refer to all tissues outside the wood.

The inner soft bark is produced by the vascular cambium; it consists of secondary phloem (food-conducting) tissue whose innermost layer transports food from the leaves to the rest of the plant. The layered outer bark contains cork and old, dead phloem.

The bark is usually thinner than the woody part of the stem or root.

bark beetle Any member of the beetle family Scolytidae, many of which severely damage trees. Bark beetles are cylindrical, brown or black, and usually less than 0.25 in.

(6 mm) long. A male and females (as many as 60 females with each male) bore into a tree and form a chamber where each female deposits her eggs.

The emerging larvae bore away from the chamber, forming a characteristic series of tunnels. Different species attack particular trees, damaging roots, stems, seeds, or fruits. Some species transmit disease (e.g., elm bark beetles carry spores of the fungal Dutch elm disease).

bark painting Abstract and figurative designs applied to nonwoven fabric made from bark. Also called tapa, the pieces are made by scratching or painting the designs. The most popular material is the inner bark of the paper mulberry tree. The bark is stripped off, soaked, and beaten until it is thin. Today hand-painted bark cloth is made in northern Australia,

New Guinea, and parts of Melanesia.

Styles and imagery vary by location,

Tapa wall drapery painted with animal clan emblems, from the Teluk Jos Sudarso (Humboldt Bay) area, Irian Jaya (West New Guinea), Indonesia, in the Rijksmuseum voor Volkenkunde Justinus van Nassau, Breda, Neth.

HOLLE BILDARCHIV, BADEN-BADEN, GER.

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from naturalistic and stylized representations of human and animal forms to mythical beings, spirals, circles, and abstract motifs.

Barker, Harley Granville- See Harley Granville- Barker

barking deer See muntjac

Barkley, Alben W(illiam) (b. Nov. 24, 1877, Graves county, Ky., U.S. — d. April 30, 1956, Lexington, Va.) U.S. politician. After graduating from college, he studied law and was admitted to the Kentucky bar in 1901. He was elected as a Democrat to the U.S. House of Representatives (1913-27) and the Senate (1927-49), where he served as majority leader (1937-47). He was a prominent spokesman for the domestic and international policies of Pres. Franklin D. Roosevelt. He served as vice president under Pres. Harry S. Truman (1949-53). He later returned to the Senate (1954-56).

Barkley, Charles (Wade) (b. Feb. 20, 1963, Leeds, Ala., U.S.) U.S. basketball player. He spent his collegiate career as a forward at Auburn University. He played for the Philadelphia 76ers (1984-91), the Phoenix Suns (1992-95), and the Houston Rockets (1996-99). He is known for his bruising play on the court and for his outspokenness off it.

Barlach Vbar-lak\, Ernst (b. Jan. 2, 1870, Wedel, Ger. — d. Oct. 24, 1938, Gustrow) German sculptor, graphic artist, and writer. After studying in Hamburg, Dresden, and Paris, he became the outstanding sculptor of the Expressionist movement, achieving a rough-hewn quality by preferring wood, the material used in late Gothic sculpture. Even when he worked with other, more contemporary materials, he often emulated the raw quality of wood sculpture to achieve a more brutal effect. He achieved fame in the 1920s and ’30s with the execution of several war memorials for the Weimar Republic. Barlach also wrote Expressionist plays, which he illustrated with woodcuts and lithographs. His studio at Gustrow was opened posthumously as a museum.

barley Cereal plant of the genus Hordeum, in the family Poaceae (or Gramineae), and its edible grain. The three cultivated species are H. vulgare, H. distichum, and H. irregulare. Barley is adaptable to a greater range of climate than any other cereal. About half of the world's crop is used as livestock feed, the rest for human food and for malting. Most beer is made from malted barley, which is also used in distilled beverages (see malt). Barley has a nutlike flavour and is high in carbohydrates, with moderate quantities of protein, calcium, and phosphorus. Barley flour is used to make unleavened bread and porridge. Pearl barley, the most popular form in many parts of the world, is often added to soups.

Barlow, Joel (b. March 24, 1754, Redding, Connecticut Colony [U.S.] — d. Dec. 24, 1812, Zarnowiec, Pol.) U.S. writer and poet. He was a member of the group of young writers known as the Hartford (or Connecticut) Wits, whose patriotism led them to attempt to create a national literature. He became famous for his Vision of Columbus (1787), a poetic paean to America, but is remembered primarily for The Hasty Pudding (1796), a mock-heroic epic poem inspired by homesickness for New England.

Barmakid Vbar-mo-.kidV or Barmecide \'bar-m3-,sld\ Any member of the priestly family of Persian origin that achieved prominence in the 8th century as scribes and viziers to the caliphs of the 'Abbasid dynasty. They supported the arts and sciences, tolerated explorations of religion and philosophy, and promoted public works. The first notable Barmakid, Khalid ibn Barmak (d. 781/782), helped establish the 'Abbasid caliphate; he became governor of Tabaristan and later Fars. His son Yahya (d. 805) and grandsons al-Fadl (d. 808) and Ja'far (d. 803) held power as viziers but died in prison or were executed in a reversal of fortune, largely because their excessive power, wealth, and liberalism led the caliphs to see them as threats.

Barmen, Synod of Meeting of German Protestant leaders at Barmen in May 1934 to organize Protestant resistance to Nazism. Representatives came from Lutheran, Reformed, and United churches. Some church leaders had already chosen to limit their efforts to passive resistance, and others had been co-opted by the Nazi regime. The Pastors' Emergency League, headed by Martin Niemoller, was the backbone of active resistance. The Synod was of major importance in the founding of the Confessing Church by Karl Barth and others.

barn Farm building used for sheltering animals, their feed and other supplies, farm machinery, and farm products. Bams are named according to their purpose (e.g., hog barns, dairy barns, tobacco bams, and tractor

bams). The principal type in the U.S. is the general-purpose barn, used for housing livestock and for storing hay and grain. Most North American and European farms have one or more barns. They usually consist of two stories, though one-story bams gained in popularity in the late 20th century.

barn owl Any of several species of sometimes called monkey-faced owls because of their heart-shaped facial disk and absence of ear tufts.

Barn owls are about 12-16 in.

(30 – 40 cm) long, white to gray or yellowish to brownish orange. Their dark eyes are smaller than those of other owls. They hunt mainly small rodents, often on cultivated land, and nest in hollow trees, buildings, towers, and old hawk nests. The common barn owl is found worldwide except in Antarctica and Micronesia.

Other species occur only in the Old World.

Barnabas \ 'bar-no-bos \, Saint orig. Joseph the Levite (fl. 1st century; feast day June 11) Apostolic Father and early Christian missionary. Born in Cyprus, he was a Hellenized Jew who joined the church in Jerusalem shortly after its founding. According to the Acts of the Apostles, he helped found the church in Antioch, calling on St. Paul to assist him. A conflict eventually separated them, and Barnabas returned to the island of his birth. One legend holds that he was martyred in Cyprus. His reputed tomb is near the Monastery of St. Barnabas at Salamis, whose Christian community Paul and Barnabas founded.

barnacle Any of a majority of the 1,000 species of the subclass Cirripedia of marine crustaceans that, as adults, are covered with a shell made of hai’d calcium-containing plates and are permanently cemented, head down, to rocks, pilings, ships’ hulls, driftwood, or seaweed or to the bodies of larger sea creatures, from clams to whales. Barnacles trap tiny particles of food with their cirri, feathery retractable organs that emerge from openings between the shell plates. Adult barnacles commonly are hermaphrodites.

barnacle goose Species (. Branta leucopsis) of waterbird that resembles a small Canada goose, with dark back, white face, and black neck and bib. It winters in the northern British Isles and on the coasts of Denmark, Germany, and the Netherlands. In the Middle Ages, it was thought to hatch from barnacles, and thus was considered “fish” and could be eaten on Fridays.

Barnard \'bar-nord\, Christiaan (Neethling) (b. Nov. 8, 1922, Beaufort West, S.Af. – d. Sept. 2, 2001, Paphos, Cyprus) South African surgeon. He showed that intestinal atresia is caused by deficient fetal blood supply, which led to development of a surgical procedure to correct the formerly fatal defect. He introduced open-heart surgery to South Africa, designed a new artificial heart valve, and did animal heart transplant experiments. In 1967 Barnard’s team performed the first human

heart transplant, replacing the heart of Louis Washkansky with one from an accident victim. The transplant was successful, but Washkansky, given immunosuppressant drugs to prevent rejection of the heart, died 18 days later from pneumonia.

Barnard, Henry (b. Jan. 24, 1811, Hartford, Conn., U.S. — d. July 5, 1900, Hartford) U.S. educator. He studied law and entered the state legislature, where he helped create a state board of education and the first teachers' institute (1839). With Horace Mann, he undertook to reform the country's common schools; he was an innovator in instituting school

nocturnal birds of prey (genus Tyto),

Common barn owl (Tyto alba).

KARL MASLOWSKI/PHOTO RESEARCHERS

Barnacle

ANTHONY MERCIECA, FROM ROOT RESOURCES-EB INC.

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inspections, textbook reviews, and parent-teacher organizations. As Rhode Island's first commissioner of education (from 1845) he worked to raise teachers' wages, repair buildings, and obtain higher-education appropriations. In 1855 he helped found the American Journal of Education. He was chancellor of the University of Wisconsin (1858-61).

In 1867 he became the first U.S. commissioner of education, in which post he established a federal agency to collect national educational data.

Barnard's Vbar-nsrdzV star Star about six light-years away from the Sun, next nearest the Sun after the Alpha Centauri system, in the constellation Ophiuchus. Named for

Edward Emerson Barnard (b.

1857 — d. 1923), who discovered it in 1916, it has the largest proper motion of any known star. It is gradually nearing the solar system. The star attracted astronomers' attention in the 1960s when its proper motion was claimed to show periodic deviations attributed to the gravitational pull of two planets (see planets of other stars). The deviations were later proved to be artifacts of measurement.

Barnburners See Hunkers and Barnburners

Barnes, Albert C(oombs) (b. Jan. 2, 1872, Philadelphia, Pa., U.S. — d. July 24, 1951, Chester county. Pa.) Pharmaceutical manufacturer and art collector. He obtained a medical degree and later studied in Germany. In 1902 he made a fortune with his invention of the antiseptic Argyrol. After building a mansion in Merion, Pa., in 1905, he began to collect art seriously, amassing some 180 paintings by Pierre- Auguste Renoir, 66 by Paul Cezanne, 35 by Pablo Picasso, and an extraordinary collection of 65 works by Henri Matisse. The Barnes Foundation, housed in quarters next to his Merion home, was chartered on Dec. 4, 1922, and opened in 1925. The 22-room structure displayed his collection in a highly personal manner that eschewed standard museum practice. The foundation also was intended to promote art education by providing art classes and by establishing a publishing program. (Barnes himself wrote and coauthored a number of books on art.) In 1961, after extensive litigation, his galleries were opened to the public.

Barnes, Djuna (b. June 12, 1892, Cornwall-on-Hudson, N.Y., U.S. — d. June 18?, 1982, New York, N.Y.) U.S. writer. Barnes worked as an artist and journalist in her youth. She went to Paris in 1920, where she became a well-known figure in the literary scene. She wrote plays, short stories, and poems; her masterpiece, the novel Nightwood (1936), tells of the homosexual and heterosexual loves of five extraordinary people. After returning to New York in 1940, she wrote little and lived reclusively.

Barnet \bar-'net\, Charlie orig. Charles Daly Barnet (b. Oct. 26, 1913, New York, N.Y., U.S. — d. Sept., 4, 1991, San Diego, Calif.) U.S. saxophonist and big-band leader of the swing era. Born to a wealthy family, Barnet took up the saxophone as a child and eventually performed on tenor, alto, and soprano. His was among the first of the big bands to be racially integrated, and his unabashed admiration for Duke Ellington and Count Basie resulted in an effective synthesis of their styles. His best-known recording was "Cherokee" (1939).

Barnett, Ida B. Wells- See Ida B. Wells

Barnsley Town and metropolitan borough (pop., 2001: 218,062), northern England. Located on the River Dearne, the town lies in the ceremonial county of South Yorkshire. Its major growth came in the 19th century as a coal-mining town in the heart of the Yorkshire coalfield. Local coal production has declined since the early 20th century, and light industries have been promoted.

Barnum, P(hineas) T(aylor) (b. July 5, 1810, Bethel, Conn., U.S. — d. April 7, 1891, Bridgeport, Conn.) U.S. showman. In 1841 he bought the American Museum, a collection of conventional exhibits in

New York City, and transformed it into a carnival of live freaks and dramatic curiosities, which he promoted with sensational publicity. He exhibited the midget Tom Thumb with great international success and brought Jenny Lind (billed as the “Swedish Nightingale”) to the U.S. for a profitable concert tour in 1850. By the time his museum closed in 1868 after several fires, he had enticed 82 million visitors there. In 1871 he started a circus and in 1881 joined a rival, James A. Bailey (1847-1906), to form the three-ring Barnum and Bailey’s Circus, which featured the elephant Jumbo as part of the “Greatest Show on Earth.”

Barocci \ba-'rot-che\, Federico (b. c.1526, Urbino, Duchy of Urbino, Papal States — d. 1612, Urbino) Italian painter. Except for two visits to Rome (mid 1550s, 1560-63), where he painted frescoes for Pope Pius IV’ s casino in the Vatican Gardens, he seems to have spent his whole life in and near Urbino. He executed altarpieces and devotional paintings in a style characterized by subtle colour harmonies and warmth of feeling. His patrons included the duke of Urbino and Emperor Rudolf II (1552—1612), and he received commissions from the cathedrals of Genoa and Perugia. His famous works include the Deposition (1567-69) and the Madonna del Popolo (1579). A prolific draftsman, he was one of the first artists to use coloured chalks. He enjoyed a long and productive career, becoming one of the leading painters in central Italy.

Baroda See Vadodara

Baroja \ba-'ro-ha\ (y Nessi), Pio (b. Dec. 28, 1872, San Sebastian, Spain — d. Oct. 30, 1956, Madrid) Basque writer. He wrote 11 trilogies dealing with contemporary social problems, the best known of which is The Struggle for Life (1904). His most ambitious project was a long cycle of works about a 19th-century insurgent and his era. He wrote almost 100 novels, including Zalacain el aventurero (1909). Because of his anti-Christian views, stubborn insistence on nonconformity, and somewhat pessimistic tone, he never achieved great popularity. He is considered the foremost Spanish novelist of his time.

barometer Device used to measure atmospheric pressure. Because atmospheric pressure changes with distance above or below sea level, a barometer can also be used to measure altitude. In the mercury barometer, atmospheric pressure balances a column of mercury, the height of which can be precisely measured. Normal atmospheric pressure is about 14.7 lb per square inch, equivalent to 30 in. (760 mm) of mercury. Other liquids can be used in barometers, but mercury is the most common because of its great density. An aneroid barometer indicates pressure on a dial using a needle that is mechanically linked to a partially evacuated chamber, which responds to pressure changes.

barometric pressure See atmospheric pressure

baron Title of nobility, ranking in modern times immediately below a viscount or a count (in countries without viscounts). The wife of a baron is a baroness. Originally, in the early Middle Ages, the term designated a tenant of whatever rank who held a tenure of barony direct from the king. Gradually, it came to mean a powerful personage, and therefore a magnate. The rights and title may be conferred for military or other honorable service.

baronet British hereditary rank of honor, first created by James I in 1611 to raise money, ostensibly for support of troops in Ulster. The baronetage is not part of the peerage, nor is it an order of knighthood. A baronet ranks below a baron but above all knights except a Knight of the Garter (see Order of the Garter). The baronetcy is inherited by the male heirs of a baronet.

Baroque, Late See Rococo style

Baroque \b3-'rok\ architecture Architectural style originating in late 16th-century Italy and lasting in some regions, notably Germany and colonial South America, until the 18th century. It had its origins in the Counter- Reformation, when the Catholic Church launched an overtly emotional and sensory appeal to the faithful through art and architecture. Complex architectural plan shapes, often based on the oval, and the dynamic opposition and interpenetration of spaces were favoured to heighten the feeling of motion and sensuality. Other characteristic qualities include grandeur, drama and contrast (especially in lighting), curvaceousness, and an often dizzying array of rich surface treatments, twisting elements, and gilded statuary. Architects unabashedly applied bright colours and illusory, vividly painted ceilings. Outstanding practitioners in Italy included Gian Lorenzo Bernini, Carlo Maderno (1556-1629), Francesco Borromini, and Guarino Guarini (1624-83). Classical elements

Henry Barnard, detail of a portrait by an unknown artist; in the University of Wisconsin collection, Madison

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subdued Baroque architecture in France. In central Europe, the Baroque arrived late but flourished in the works of such architects as the Austrian Johann Bernhard Fischer von Erlach (1656-1723). Its impact in Britain can be seen in the works of Christopher Wren. The late Baroque style is often referred to as Rococo or, in Spain and Spanish America, as Churrigueresque.

Baroque period (17th– 18th century) Era in the arts that originated in Italy in the 17th century and flourished elsewhere well into the 18th century. It embraced painting, sculpture, architecture, decorative arts, and music. The word, derived from a Portuguese term for an irregularly shaped pearl and originally used derogatorily, has long been employed to describe a variety of characteristics, from dramatic to bizarre to overdecorated. The style was embraced by countries absorbed in the Counter-Reformation; artworks commissioned by the Roman Catholic church were overtly emotional and sensory. The period’s most notable practitioners

were Annibale Carracci (see Carracci family), Caravaggio, and Gian Lorenzo Bernini. A spectacular example of the Baroque arts is the Palace of Versailles. In music, the Baroque era is usually considered to extend from c. 1600 to c. 1750, when such significant new vocal and instrumental genres as opera, oratorio, cantata, sonata, and concerto were introduced and such towering composers as Claudio Monteverdi, J.S. Bach, and George Frideric Handel flourished.

Barotse See Lozi

Barquisimeto V.bar-ke-se-'ma-toN City (pop., 2000 est.: 875,790), northwestern Venezuela. The capital of Lara state, it is located at the northern end of the Cordillera Merida, at an elevation of 1,800 ft (500 m). Founded in 1552 as Nueva Segovia, it is one of the country's oldest cities. It was almost destroyed by an earthquake in 1812 and was further damaged in 19th-century civil wars. It is a hub of transport and commerce and the centre of an agricultural region.

barracuda Any of about 20 species of predaceous marine fishes (family Sphyraenidae) found in all warm and tropical regions and in some more temperate areas. Swift and powerful, barracudas are slender and have small scales, a jutting lower jaw, and a large mouth with many large, sharp teeth. They vary in size from relatively small to 4-6 ft (1.2- 1.8 m) long. They are primarily fish eaters. They are popular sport fishes and are caught for food, though in certain seas they may become contaminated with a toxic substance. Bold and inquisitive, they are potentially dangerous to humans when large.

Barracuda (Sphyraena)

C. LEROY FRENCH/TOM STACK & ASSOCIATES

Barranquilla \,ba-ran-'ke-ya\ City (pop., 1999: 1,226,292), northern Colombia. Founded in 1629 about 10 mi (16 km) from the mouth of the Magdalena River, it remained unimportant until the 1930s, when the clearing of sandbars made it an important port on the Caribbean Sea. It has since been rivaled by the Pacific Ocean port of Buenaventura, but it still handles goods from the interior and is the terminus of natural-gas pipelines from northern Colombia.

Barraque \ba-ra-'ka\, Jean (b. Jan. 17, 1928, Puteaux, France — d. Aug. 17, 1973, Paris) French composer. He studied at the Paris Conservatoire with Jean Langlais (1907-91) and Olivier Messiaen. His major work, employing a radically nonrepetitive style, was a planned five-part reflection on Hermann Broch's novel The Death of Virgil, of which he completed three parts — . . . au-deld du hasard (1959), Chant apres chant

(1966), and Le Temps restitue (1968) — before his early death. He also composed a long piano sonata (1952) and a clarinet concerto (1968).

Barras \ba-'ras\, Paul-Francois-Jean-Nicolas, viscount de (b.

June 30, 1755, Fox-Amphoux, France — d. Jan. 29, 1829, Chaillot) French revolutionary. A Provencal nobleman, Barras became disenchanted with

the royal regime and welcomed the French Revolution. Elected to the National Convention (1792), he played a key role in the overthrow of Maximiuen Robespierre and emerged as the commander of the army of the interior and the police. In 1795 he and Napoleon defended the regime against a royalist insurrection and established the Directory, with Barras as chief among the five directors. The Coup of 18 Fructidor brought him greater power, but he was overthrown in 1799 and exiled from Paris on suspicion of conspiracy to restore the monarchy.

Barrault \ba-'ro\, Jean-Louis (b. Sept. 8, 1910, Le Vesinet, France — d. Jan. 22, 1994, Paris) French actor and director. He made his acting debut in Paris (1931) and joined the Comedie-Francaise (1940-46) as an actor and director. He and his wife, Madeleine Renaud, formed their own company (1946-58) at the Theatre Marigny. There they performed a mixture of French and foreign classics and modern plays that helped revive French theatre after World War II. He was appointed director of the Theatre de France (1959-68) and later directed at several other Paris theatres (1972-81). He appeared in more than 20 films and was best known for his role in The Children of Paradise (1945).

Barre, Mohamed Siad See Mohamed Siad Barre

Bar res \ba-'res\, (Auguste-) Maurice (b. Aug. 19, 1862, Charmes-sur-Moselle, France — d. Dec. 5,

1923, Paris) French writer and politician. He served in the Chamber of Deputies (1889-93) and became a strong nationalist. With Charles Maurras, he expounded the doctrines of the French Nationalist Party in two newspapers, and in his novels he expressed an individualism that included a deep-rooted attachment to one’s native region. His series of novels titled Les Bastions de I’Est earned success as French propaganda during World War I.

Barrie, Sir James (Matthew)

(b. May 9, 1860, Kirriemuir, Angus,

Scot. — d. June 19, 1937, London,

Eng.) Scottish playwright and novelist. After moving to London, he wrote Auld Licht Idylls (1888), a book about his native Scotland. His best-selling novel The Little Minister (1891) was made into a play in 1897. His plays Quality Street (1901) and The Admirable Crichton (1902) ran successfully in London. After creating the stories of Peter Pan for a friend’s sons, he won great success with his classic children’s play Peter Pan, the Boy Who Wouldn’t Grow Up (1904). His other plays include The Twelve-Pound Look (1910) and Dear Brutus (1917).

barrier penetration See tunneling

barrister Vbar-o-storX One of two types of practicing lawyers in Britain (the other is the solicitor). Barristers engage in advocacy (trial work), and only they may argue cases before a high court. A barrister must be a member of one of the four Inns of Court. In Canada, all lawyers are both barristers and solicitors, though individual lawyers may describe themselves as one or the other. In Scotland trial lawyers are called advocates.

Barrow, Clyde See Bonnie and Clyde

Barry \dtE-ba-'re\, (Marie-) Jeanne Becu, countess du known as Madame du Barry (b. Aug. 19, 1743, Vaucouleurs, France — d. Dec. 8, 1793, Paris) French mistress of Louis XV. A Paris shop assistant, she became the mistress of Jean du Barry, who introduced her into Parisian high society. Admired for her beauty, she joined Louis XV' s court in 1769 after a nominal marriage to Jean's brother, a nobleman, qualified her as Louis's official royal mistress. Though she exercised little political influence, her unpopularity contributed to the decline of the prestige of the crown in the early 1770s. After Louis's death (1774), she was ban-

Barres, 1 906.

H. ROGER-VIOLLET

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ished from court. In the French Revolution she was condemned as a counterrevolutionary and guillotined.

Barry, John (b. 1745, County Wexford, Ire. — d. Sept. 13, 1803, Philadelphia, Pa., U.S.) Irish-born American naval officer. He immigrated to America in 1760 and was a merchant shipmaster out of Philadelphia at age 21. He outfitted the first American fleet in 1776, and as captain of a frigate he captured several British ships. He fought the last battle of the American Revolution in March 1783 in the Straits of Florida, where he defeated three British ships. After the war he was recalled to active service as senior captain of the new U.S. Navy. He was often called the "Father of the Navy" because he trained many future naval officers.

Barrymore family U.S. theatrical family. Maurice Barrymore (orig. Herbert Blythe; 1847-1905) made his stage debut in London before moving to New York City (1875), where he adopted Barrymore as his stage name. He joined Augustin Daly's company and in 1876 married Georgiana Drew, of the theatrical Drew family. Their eldest child, Lionel Barrymore (orig. Lionel Blythe; 1878-1954), became a leading Broadway actor in plays such as Peter Ibbetson (1917) and The Copperhead (1918), then moved to Hollywood in 1926, where he appeared in films such as A Free Soul (1931, Academy Award) and Grand Hotel (1932). Famous as a char-

acter actor, he made some 200 films, including 15 Dr. Kildare pictures. His sister Ethel Barrymore (orig. Ethel Blythe; 1879-1959) appeared in London in Peter the Great (1898) and on Broadway in Captain Jinks of the Horse Marines (1901). She opened the New York theatre named for her in 1928 in The Kingdom of God and later starred in The Corn Is Green (1940). She appeared in more than 30 films, including None but the Lonely Heart (1944, Academy Award) and The Spiral Staircase (1946). Their brother John Barrymore (orig. John Blythe; 1882-1942) was acclaimed in plays such as Justice (1916), Richard III (1920), and especially Hamlet (1922). His films include Dr. Jekyll and Mr. Hyde (1920) and Dinner at Eight (1933). An alcoholic, he was known for his flamboyant behaviour. John's granddaughter Drew Barrymore (b. 1975) first won notice at age seven in the film E.T. (1982).

barter Direct exchange of goods or services without the use of money or any other intervening medium of exchange. Barter is conducted either according to established rates of exchange or by bargaining. Barter is common among preliterate societies, particularly in those communities with some developed form of market. Goods may be bartered within a group as well as between groups, although gif exchange probably accounts for most intragroup trade, particularly in small and relatively simple societies. See also currency.

Barth, John orig. John Simmons Barth, Jr. (b. May 27, 1930, Cambridge, Md., U.S.) U.S. writer. Barth grew up on Maryland's eastern shore, the locale of much of his writing, and from 1953 he taught principally at Johns Hopkins University. Apart from the experimental pieces in Lost in the Funhouse (1968), his best-known works are the novels The Floating Opera (1956), The End of the Road (1958), The Sot-Weed Factor (1960), Giles Goat-Boy (1966), and The Tidewater Tales (1987), most of which play with and parody traditional narrative forms, combining philosophical depth with biting satire and boisterous, often bawdy humour. In 2001 he published the experimental novel Coming Soon!!!: A Narrative, which was not well received.

Barth \'bart\, Karl (b. May 10, 1886, Basel, Switz. — d. Dec. 9/10, 1968, Basel) Swiss theologian. He studied at the Universities of Berlin, Tubingen, and Marburg, and in 1911-21 he was a pastor at Safenwil, Switz. The tragedy of World War I made him question the liberal theology of his teachers, rooted in post-Enlightenment ideas. With The Epistle to the Romans (1919) he inaugurated a radical turnaround in Protestant thought, initiating a trend toward neoorthodoxy. The work led to his appointment as professor at Gottingen (1921), Munster (1925), and Bonn (1930). He was a founder of the Confessing Church, which opposed the Nazi regime; when his refusal to take the oath of allegiance to Adolf Hitler cost him his chair at Bonn, he returned to Basel. He spoke at the opening of the World Council of Churches in 1948 and visited Rome following the Second Vatican Council.

Barthelme \'bart-ol-me\, Donald (b. April 7, 1931, Philadelphia, Pa., U.S. — d. July 23, 1989, Houston, Texas) U.S. writer. Barthelme worked as a journalist, journal editor, and museum director before his fiction began to be published. He is known for modernist "collages" marked by technical experimentation and melancholy gaiety. His story collections include Come Back, Dr. Caligari (1964), City Life (1970), Sixty Stories

(1981), and Overnight to Many Distant Cities (1983); his novels include

Snow White (1967), The Dead Father (1975), Paradise (1986), and The King (1990). His brother Frederick (b. 1943) is also a novelist (Second Marriage, 1984) and short-story writer {Moon Deluxe, 1983).

Barthes \'bart\, Roland (Gerard) (b. Nov. 12, 1915, Cherbourg, France — d. March 25, 1980, Paris) French social and literary critic. His early books examined the arbitrariness of the constructs of language and applied similar analyses to popular-culture phenomena. He analyzed mass culture in Mythologies (1957). On Racine (1963) set off a literary furor, pitting him against more traditional French literary scholars. His later contributions to SEMIOTICS included the even more radical S/Z (1970); The Empire of Signs (1970), his study of Japan; and other significant works that brought his theories wide (if belated) attention in the 1970s and helped establish structuralism as one of the leading intellectual movements of the 20th century. In 1976 he became the first person to hold the chair of literary semiology at the College de France.

Bartholdi \bar-'tol-de\, Frederic-Auguste (b. April 2, 1834, Colmar, Alsace, Fr. — d. Oct. 4, 1904, Paris) French sculptor. He studied sculpture and painting in Paris. In 1865 he and several others conceived the idea for a monument to the Franco- American alliance of 1778. Beginning work in 1870, Bartholdi designed the huge statue that would come to be known as the “Statue of Liberty” (1875-86) and was able to see its construction through using funds he raised in both France and the U.S. While not as famous, his masterpiece is the Lion of Belfort (1871-80), carved out of the red sandstone of a hill overlooking Belfort in eastern France.

Bartholomaeus Vbar-.tol-o-'ma-osX (Anglicus) or Bartholomew the Englishman (fl. c. 1220^4-0) Franciscan encyclopedist. Though primarily interested in scripture and theology, in his 19- volume encyclopedia On the Properties of Things he covered all customary knowledge of his time and was the first to make readily available the views of Greek, Jewish, and Arabic scholars on medical and scientific subjects. The encyclopedia was printed in English translation c. 1495.

Bartholomew, Saint (fl. 1st century ad — d. traditionally Albanopolis, Armenia; Western feast day August 24; date varies in Eastern churches) One of the Twelve Apostles of Jesus. He is mentioned only briefly in the Gospels, and his Hebrew name may have been Nathanael bar Tolmai. By tradition he was a missionary to Ethiopia, Mesopotamia, Parthia (in modern Iran), Lycaonia (in modem Turkey), and Armenia. He was supposedly martyred at the command of the Armenian king Astyages, who had him flayed and beheaded.

Barthou \bar-'tii\, (Jean-) Louis (b. Aug. 25, 1862, Oloron-Sainte-Marie, France — d. Oct. 9, 1934, Marseille) French politician. Elected to the Chamber of Deputies in 1889, he served in various conservative governments. He was appointed premier (1913) and secured the passage of a bill requiring three years’ compulsive military service. He represented France at the Conference of Genoa, entered the Senate, and became chairman of the reparations commission. Named foreign minister in 1934, he was assassinated with King Alexander of Yugoslavia during the latter’s visit to France.

Bartlett, Sir Frederic C(harles) (b. Oct. 20, 1886, Stow-on-the-Wold, Gloucestershire, Eng. — d. Sept. 30, 1969, Cambridge, Cambridgeshire) British psychologist

best known for his studies of memory. The first professor of experimental psychology at the University of Cambridge (1931-52), he also directed the university’s psychological laboratory. His major work, Remembering (1932), described memories not as direct recollections but rather as mental reconstructions coloured by cultural attitudes and personal habits.

Bartlett, John (b. June 14, 1820,

Plymouth, Mass., U.S. — d. Dec. 3,

1905, Cambridge, Mass.) U.S. bookseller and editor. Bartlett was an employee and then owner of the Harvard University Bookstore. In 1855 courtesy of little, brown and co.

John Bartlett

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he published the work for which he is best known, Familiar Quotations, based largely on a notebook he kept for his customers. It was greatly expanded in later editions; the 17th edition appeared in 2002. He also wrote a complete concordance to Shakespeare’s dramatic works and poems (1894), outstanding for the number and fullness of its citations.

Bartok Vbar-t6k\, Bela (b. March 25, 1881, Nagyszentmiklos, Hung., Austria-Hungary— d. Sept. 26, 1945, New York, N.Y., U.S.) Hungarian composer, pianist, and ethnomusicologist. He developed a superb piano technique at an early age. In 1904 he set about researching Hungarian folk music, having discovered that the folk-music repertory generally accepted as Hungarian was in fact largely urban Roma (Gypsy) music (see Rom). His fieldwork with the composer Zoltan KodAly formed the basis for all later research in the field, and he published major studies of Hungarian, Romanian, and Slovakian folk music. He worked folk themes and rhythms into his own music, achieving a style that was at once nationalistic and deeply personal. He also toured widely as a virtuoso pianist. In 1940 he immigrated to the U.S. , where he was inadequately recognized. His works include the opera Bluebeard’s Castle (1911), six celebrated string quartets (1908-39), the didactic piano set Mikrokosmos (1926-39), Sonata for Two Pianos and Percussion (1937), Concerto for Orchestra (1943), and three piano concertos (1926, 1931, 1945).

Bartolome de Cardenas See Bartolome Bermejo

Bartolomeo V.bar-to-lo-'ma-oV, Fra orig. Baccio della Porta (b.

March 28, 1472, Florence — d. Oct. 31, 1517, Florence) Italian painter active in Florence. His early works, such as the Annunciation (1497) in Volterra Cathedral, were influenced by Perugino and Leonardo da Vinci. In 1500 he joined the Dominican order. He painted religious subjects, primarily the Madonna and Child in various settings, with monumental figures grouped in balanced compositions. He became a prominent exponent of the High Renaissance style and was the leading painter in Florence, rivaled only by Andrea del Sarto.

Barton, Clara orig. Clarissa Harlowe (b. Dec. 25, 1821, Oxford, Mass., U.S. — d. April 12, 1912, Glen Echo, Md.) U.S. nurse, founder of the American Red Cross. She attended the Liberal Institute at Clinton, N.Y. (1850-51). In 1852 she established a free school in Bordentown, N.J., that soon became so large that the townsmen would no longer allow a woman to run it. After resigning her post, she was employed by the U.S. Patent Office in Washington, D.C. (1854-57, 1860). During the American Civil War she organized the distribution of medicine and supplies for soldiers wounded in the first Battle of Bull Run. She gained permission to pass through battle lines to distribute supplies, search for the missing, and nurse the wounded, becoming known as the “angel of the battlefield.” In 1865, at the request of Pres. Abraham Lincoln, she set up a bureau of records to aid in the search for missing men. While in Europe for a rest, she helped with relief work for victims of the Franco-Prussian War (1870-71) and became associated with the International Red Cross. In 1881 she founded the American Red Cross. She lobbied Congress to sign the Geneva Convention (see Geneva Conventions), which provided for the treatment of the sick and wounded in battle and the proper handling of prisoners of war. She wrote the U.S. amendment to the constitution of the Red Cross, which provides for the distribution of relief not only in war but also during natural disasters. She served as president of the American Red Cross until 1904.

Barton, Sir Derek H(arold) R(ichard) (b. Sept. 8, 1918, Gravesend, Kent, Eng. — d. March 16, 1998, College Station, Texas, U.S.) British chemist. Unsatisfied in his father’s carpentry business, he entered London’s Imperial College and received his doctorate in 1942. His studies revealed that organic molecules have a preferred three-dimensional form from which their chemical properties can be inferred. This research earned him the 1969 Nobel Prize for Chemistry, shared with Odd Hassel of Norway.

Bartram Vbar-troirA, John (b. March 23, 1699, Marple, Pa., U.S. — d. Sept. 22, 1777, Kingsessing, Pa.) naturalist and explorer, considered the “father of American botany.” Largely self-educated, he was a friend of Benjamin Franklin and the botanist for the American colonies to George III. He was the first North American experimenter to hybridize flowering plants, and he established near Philadelphia a botanical garden that became internationally famous. He explored the Alleghenies and the Carolinas and in 1743 was commissioned by the British crown to explore the wilderness north to Lake Ontario in Canada. In 1765-66 he explored extensively in Florida with his son William Bartram.

Bartram, William (b. April 9, 1739, Kingsessing, Pa., U.S. — d. July

22, 1823, Kingsessing) U.S. naturalist, botanist, and artist, the son of John Bartram, he described the abundant river swamps of the southeastern U.S. in their primeval condition in his Travels through North and South Carolina, Georgia, East and West Florida (1791). The book was influential among the English and French Romantics (see Romanticism). Bartram was also noted for his renderings of plants and animals.

Baruch \b3-'riik\, Bernard (Mannes) (b. Aug. 19, 1870, Camden, S.C., U.S. — d. June 20, 1965, New York, N.Y.) U.S. financier and adviser to presidents. After graduating from the College of the City of New York in 1889, he went to work in Wall Street brokerage houses, where he amassed a fortune as a speculator. During World War I he was appointed chairman of the War Industries Board by Pres. Woodrow Wilson. In 1919 he was a member of the Supreme Economic Council at the Paris Peace Conference at Versailles and one of Wilson's advisers on the terms of peace. During World War II he served as an unofficial adviser on economic mobilization to Pres. Franklin D. Roosevelt. Later he was instrumental in setting UN policy on the international control of atomic energy.

Barye \ba-'re\, Antoine- Lou is (b. Sept. 24, 1796, Paris, Fr. — d. June 29, 1875, Paris) French sculptor. The son of a goldsmith, he was apprenticed at 13 to an engraver. He studied at the Ecole des Beaux- Arts (181 8—23) and began to sculpt animal forms c. 1819. Influenced by Theodore Gericault, he had a unique talent for rendering dynamic tension and exact anatomical detail. His most famous works depict wild animals devouring their prey; he also rendered groups of domestic animals. His notable bronzes include Lion Devouring a Gavial Crocodile (1831) and an equestrian statue of Napoleon at Ajaccio, Corsica (1860-65).

baryon \'bar-e-,an\ Any member of one of two classes of hadrons. Baryons are heavy subatomic particles made up of three quarks. They are characterized by a baryon number, B, of 1, and have half-integer spin values. Their antiparticles (see antimatter), called antibaryons, have a baryon number of -1. Both protons and neutrons are baryons.

Baryshnikov Xbo-'rish-no-.kofX, Mikhail (Nikolayevich) (b. Jan. 28, 1948, Riga, Latvia, U.S.S.R.) Latvian-born U.S. dancer. After entering the Kirov Ballet's training school in St. Petersburg in 1963, he joined the company as a soloist in 1966. There he quickly became popular with Soviet audiences, dancing leading roles created for him in ballets such as Gorianka (1968) and Vestris (1969). He defected while on tour in Canada in 1974. He danced with American Ballet Theatre until 1978, winning enormous acclaim, and he served as its artistic director from 1980 to 1989. He danced and acted in several movies and on television.

barytes See barite

barzakh Vbar-,zak\, al- Arabic "obstacle" or "barrier" Term that appears in the Qur'an on three separate occasions and has been interpreted in various ways by Muslim commentators. In one surah (chapter), it refers to the barrier that prevents the dead from returning to earth to accomplish the good they left undone in life. It has been understood as a physical barrier between heaven and hell and as a moral prohibition by God. The term is used elsewhere in the Qur'an to describe a barrier between two seas, one saltier than the other, whose waters meet but do not mix. In Sufism, barzakh is understood as the barrier between the material world and the world of God and the angels.

basalt \b3-'solt\ Dark igneous rock that is low in silica content and comparatively rich in iron and magnesium. Some basalts are glassy (have no visible crystals), and many are very fine-grained and compact. Basaltic lavas may be spongy or pumice-like. Olivine and augite are the most common minerals in basalts; plagioclase is also present. Basalts may be broadly classified into two main groups. Calc-alkali basalts predominate among the lavas of mountain belts; the active volcanoes of Mauna Loa and Kilauea in Hawaii erupt calc-alkali lavas. Alkali basalts predominate among the lavas of the ocean basins and are also common in mountain belts.

base In chemistry, any substance that in water solution is slippery to the touch, tastes bitter, changes the colour of acid-base indicators (e.g., litmus paper), reacts with acids to form salts, and promotes certain chemical reactions (e.g., base catalysis). Examples of bases are the hydroxides of the alkali metals and alkaline earth metals (sodium, calcium, etc.; see caustic soda) and the water solutions of ammonia or its derivatives (amines). Such substances produce hydroxide ions (OH -) in water solutions. Broader

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baseball ► Basho I 173

pitcher’s mound

(60.5 ft [18.4 m] from home plate)

A typical college or professional baseball field. The batter stands at home plate, the
falls outside the foul lines, the batter may not run. Any ball over the fence represent
and third base tell runners when to run. In the dugout, players wait to bat. Home-run f
from field to field. Softball is played on a similar field, but with bases closer toget
mound closer to the plate (40 ft for women, 46 ft for men), and the home-run fence may

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definitions of bases cover situations in which water is not present. See also ACID-BASE THEORY; ALKALI; NUCLEOPHILE.

baseball Game played with a bat and ball between two teams of nine players (or 10, if a designated hitter bats and runs for the pitcher). Baseball is played on a large field that has four bases laid out in a square, positioned like a diamond, whose outlines mark the course a runner must take to score. Teams alternate positions as batters and fielders,

exchanging places when three members of the batting team are put out.

Batters try to hit a pitched ball out of reach of the fielding team and complete a circuit around the bases in order to score a “run.” The team that scores the most runs in nine innings (times at bat) wins the game. If a game is tied, extra innings are played until the tie is broken. Baseball is traditionally considered the national pastime of the United States. It was once thought to have been invented in 1839 by Abner Doubleday in Coopers town, N.Y., but it is more likely that baseball developed from an 18th-century English game called rounders that was modified by Alexander Cartwright. The first professional association was formed in 1871; in 1876 it became the National League. Its rival, the American League, was founded in 1900, and since 1903 (except in 1904 and 1994) the winning teams of each league have played a postseason championship known as the World Series. The Baseball Hall of Fame is located in Cooperstown. Professional baseball leagues also exist in several Latin American countries. The champions of leagues in the Dominican Republic, Mexico, Puerto Rico, and Venezuela compete in the Caribbean Series each February. In Asia there are professional baseball leagues in Japan, South Korea, and Taiwan. Japan has two major leagues, the Central and the Pacific, that face off in the Japan Series every October.

Basel Vba-zolX or Basle Vbal\ French Bale Ybal\ City (2000: city, 166,558; metro, area, 402,387), northwestern Switzerland. It straddles the Rhine at the point where France, Germany, and Switzerland meet. It was originally a settlement of the Celtic Rauraci tribe. Its university, the first in Switzerland, was founded by Pope Pius II while attending the Council of Basel (143 1 — 49). In 1501 Basel was admitted into the Swiss Confederation. When Desiderius Erasmus taught at the university (1521-29), the city became a centre of humanism and of the Reformation. Primarily German-speaking and Protestant, it is an important trading and industrial city and river port.

Basel, Council of (1431^-9) Council of the Roman Catholic church held in Basel, Switz. It addressed the question of ultimate authority in the church and the problem of the Hussite heresy. Its members renewed the decree Sacrosancta (issued by the Council of Constance), which declared the council’s authority to be greater than the pope’s, and voted to receive most Hussites back into the church on terms opposed by the pope. In 1437 Pope Eugenius IV transferred the council to Ferrara to negotiate reunion with the Orthodox church more effectively, but several members remained in Basel as a rump council and declared Eugenius deposed. They then elected a new pope, Felix V, and the renewed schism cost the council its prestige and popular support. On the death of Eugenius, his successor, Nicholas V, obliged the antipope Felix to abdicate, ended the rump council, and brought the conciliar movement to a close.

basenji \bo-'sen-je\ Ancient breed of hound native to central Africa, where it is used to point and retrieve and to drive quarry into a net. Known as the barkless dog, it produces a variety of sounds other than barks. Its finely wrinkled forehead, erect ears, and tightly curled tail give it a char-

acteristic alert expression. It has a short, silky reddish brown, black, or black-and-tan coat and white feet, chest, and tail tip. It stands 16-17 in.

(41^43 cm) high and weighs 22-24 lbs (10-1 1 kg). It is clean and gentle.

BASF AG German chemical and plastics manufacturing company.

Founded in 1865, BASF (the full German name means “Baden Aniline and Soda Factory”) was part of the chemical cartel IG Farben from 1925 until 1945, when the latter was dissolved by the Allies. Refounded in 1952, BASF expanded operations globally to become one of the world’s largest chemical companies. Its products have included oil and natural gas, fertilizers, synthetic fibers, dyes and pigments, inks and printing accessories. BASF sold its pharmaceutical company, Knoll, in 2001 to focus on its chemical businesses. Its headquarters are in Ludwigshafen am Rhein.

Bashan Vba-shonV Ancient polity, eastern Palestine. Frequently cited in the Old Testament and later important in the Roman Republic and Empire, it was located in what is now Syria. In New Testament times, Bashan ranked as one of the great granaries of Rome. One of its towns, Bostra (Busra al-Sham), was important to both Nabataea and Rome. Augustus made Herod the Great ruler of Bashan, and in ad 106 Trajan brought the whole Nabataean kingdom under the empire in creating the province of Arabia, with Bostra as its capital. The country went into decline in the 7th century.

Basho \,bash-'o\ or Matsuo \ma-'tsii-o\ Basho orig. Matsuo Munefusa (b. 1644, Ueno, Iga province, Japan — d. Nov. 28, 1694, Osaka) Japanese haiku poet, the greatest practitioner of the form. Following the Zen philosophy he studied, he attempted to compress the meaning of the world into the simple pattern of his poetry, disclosing hidden hopes in small things and showing the interdependence of all objects. His

Basenji

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The Narrow Road to the Deep North (1694), a poetic prose travelogue, is one of the loveliest works of Japanese literature.

BASIC in full Beginner's All-purpose Symbolic Instruction Code Computer programming language developed by John G. Kemeny and Thomas E. Kurtz (b. 1928) at Dartmouth College in the mid 1960s. One of the simplest high-level languages, with commands similar to English, it can be learned with relative ease even by schoolchildren and novice programmers. Since c. 1980, BASIC has been popular for use on personal COMPUTERS.

basic Bessemer process Modification of the Bessemer process for converting pig iron into steel. The original Bessemer converter was not effective in removing the phosphorus from iron made from the high-phosphorus ores common in Britain and Europe. The invention of the basic process in England by Sidney G. Thomas (1850-1885) and Percy Gilchrist overcame this problem; the Thomas-Gilchrist converter was lined with a basic material such as burned limestone rather than an acid siliceous material. The introduction of the basic Bessemer process in 1879 made it possible for the first time for such high-phosphorus ore to be used for making steel.

Basic Input/Output System See BIOS

basic oxygen process Steelmaking method in which pure oxygen is blown through a long, movable lance into a bath of molten blast-furnace iron and scrap, in a steel furnace with a refractory lining called a converter. The oxygen initiates a series of heat-releasing reactions, including the oxidation of such impurities as silicon, carbon, phosphorus, and manganese; carbon dioxide is released, and the oxidation products of the other impurities form molten slag that floats on the molten steel. The advantages of using pure oxygen instead of air in refining iron into steel were recognized as early as the 1850s (see Bessemer process), but the process could not be commercialized until the late 1940s, when cheap, high-purity oxygen became available. Within 40 years it had replaced the open-hearth process and was producing more than half of all steel worldwide. Commercial advantages include high production rates, less labour, and steel with a low nitrogen content.

basic rocks See acid and basic rocks

basidiomycete Xbo-.si-de-o-'mI-.setX Any of a large and diverse class of fungi (division Mycota), including jelly and shelf, or bracket, fungi; mushrooms, puffballs, and stinkhorns; and the rusts and smuts. The club-shaped, SPORE-bearing organ (basidium) is borne on a usually large and conspicuous fruiting body. Basidiomycetes include bird’s-nest fungi, whose hollow fruiting bodies resemble nests containing eggs. The 15 species of the order Exobasidiales are parasitic on higher plants, particularly azaleas and rhododendrons. Jelly fungi are so called because they have jellylike, often colourful fruiting bodies. See also fungus.

Basie \'ba-se\, Count orig. William Allen Basie (b. Aug. 21, 1904, Red Bank, N.J., U.S. — d. April 26,

1984, Hollywood, Fla.) U.S. jazz pianist and bandleader. Basie was influenced by the Harlem pianists James P. Johnson and Fats Waller. In Kansas City in 1936 he formed his own band, which became known as the most refined exponent of swing.

Its rhythm section was noted for its lightness, precision, and relaxation; on this foundation, the brass and reed sections developed a vocabulary of riffs and motifs. Their hit recordings included “One O’Clock Jump” and “Jumpin’ at the Woodside.” Basie’s piano style became increasingly spare and economical. His soloists included singer Jimmy Rushing, trumpeters Buck Clayton and Harry (“Sweets”) Edison, and saxophonist Lester Young. Basie’s reorganized band of the 1950s placed greater emphasis on ensemble work and developed a more powerful style Count Basie, 1969. built from the riffs and buoyant ^ joy/globe photos

rhythm of the earlier group. The band achieved renewed popularity for recordings featuring vocalist Joe Williams.

basil Herb consisting of the dried leaves of Ocimum basilicum, an annual herb of the mint family, native to India and Iran. The dried large-leaf varieties have a fragrant aroma faintly reminiscent of anise, with a warm, sweet, aromatic, mildly pungent flavour. The dried leaves of common basil are less fragrant and more pungent. Basil is widely grown as a kitchen herb. Tea made from basil leaves is a stimulant. The heart-shaped basil leaf is a symbol of love in Italy.

Basil Vba-z3l\ I known as Basil the Macedonian (b. 826/835, Thrace — d. Aug. 29, 886) Byzantine emperor (867-86) and founder of the Macedonian dynasty. Born into a peasant family in Macedonia, he won employment in official circles in Constantinople and was made chamberlain by the reigning emperor, Michael III. He became coemperor with Michael in 866 and murdered him the next year. Basil won victories against Muslim forces along the eastern borders of Asia Minor and asserted control over Slavs in the Balkans. He gained ground in southern Italy but lost Syracuse (878) and other key cities in Sicily to the Muslims. He also formulated the Greek legal code known as the Basilica. In later life Basil showed signs of madness.

Basil II known as Basil Bulgaroctonus X.bul-go-'rak-to-nssV ("Slayer of the Bulgars") (b. 957/958— d. Dec. 15, 1025) Byzantine emperor (976-1025). Crowned coemperor with his brother in 960, he had to exile the grand chamberlain (985) and defeat rival generals (989) in

order to gain the authority to rule. Basil became one of the strongest Byzantine emperors, winning territory in the Balkans, Mesopotamia, Armenia, and Georgia. He was noted for his victory (1014) in the war with Bulgaria, which ended with his blinding all the soldiers in the defeated Bulgarian army. He increased his domestic authority by attacking the landed interests of the military aristocracy and of the church. Because Basil left no able successor, the gains of his rule were soon undone.

Basil the Great, Saint (b. ad 329, Caesarea Mazaca, Cappadocia — d. Jan. 1, 379, Caesarea; Western feast day January 2; Eastern feast day January 1) Early church father. Born into a Christian family in Cappadocia, he studied at Caesarea, Constantinople, and Athens and later established a monastic settlement on the family estate at Annesi. He opposed Arianism, which was supported by the emperor Valens and his own bishop Dianius, and organized resistance to it after 365. He succeeded Eusebius as bishop of Caesarea in 370. He died shortly after Valens, whose death in battle opened the way for the victory of Basil's cause. More than 300 of his letters survive; several of his Canonical Epistles have become part of canon law in Eastern Orthodoxy.

basilica Originally a secular public building in ancient Rome, typically a large rectangular structure with an open hall and a raised platform at one or both ends. In one type, the central hall was flanked by side aisles set off by colonnades, and the raised platform was enclosed by an apse. The early Christians adopted this type for their churches. In the typical early Christian basilica, the columns separating the nave from the lower side aisles carried either arches or entablatures, above which rose clerestory walls that supported the roof. The long nave came to be crossed just before the apse by a shorter transept, creating the cross-shaped plan that remains a standard church form to the present. "Basilica" is also a title of honor given to a Roman Catholic or Greek Orthodox church distinguished by its antiquity or its role as an international center of worship. See also cathedral.

Basilicata \ba-,ze-le-'ka-ta\ Autonomous region (pop., 2001 prelim.: 595,727), southern Italy. Roughly divided into a western mountainous region and an eastern section of low hills and wide valleys, its capital is Potenza. Known in ancient times as Lucania, the area was under Lombard League rule in the early Middle Ages. Until the fall of the Swabian Hohenstaufens (1254), it played a significant part in the affairs of southern Italy;

St. Basil, detail of a mosaic, 1 2th century; in the Palatine Chapel, Palermo, Sicily, Italy.

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later it followed the variable fortunes of the Kingdom of Naples until united with the Kingdom of Italy in 1861. The region suffered severe damage in a disastrous earthquake in 1980. Agriculture is an economic mainstay.

Basilides V.ba-so-'lI-dezV (fl. 2nd century ad, Alexandria) Founder of the Basilidian school of Gnosticism. According to Clement of Alexandria, Basilides claimed to base his teaching on a secret tradition of Peter the Apostle. He wrote psalms, odes, commentaries on the Gospels, and his own gospel. Fragments of these writings and varying accounts by Clement, St. Irenaeus, and others suggest that his system of belief included elements from Neoplatonism as well as the New Testament. The school survived in Egypt until the 4th century.

Baskerville, John (b. Jan. 28, 1706, Wolverly, Worcestershire, Eng. — d. Jan. 8, 1775, Birmingham,

Warwickshire) British typographer.

In 1757 he set up a printing house and published his first work, an edition of Virgil. His editions of the Latin classics, John Milton’s poems (1758), and a folio Bible (1763) are characterized by clear and careful presswork rather than ornament; they are among the finest examples of the art of printing. He served as printer to Cambridge University (1758-68), and he created the widely used Baskerville typeface, which is still used and prized for its clarity and balance.

basketball Court game between two teams of five players. They score by tossing, or “shooting,” an inflated ball through a raised hoop, or “basket,” located in their opponent’ s end of the court. A goal is worth two points, three if shot from outside a specified limit. A player who is fouled (through unwarranted physical contact) by another is awarded one to three free-throw attempts (depending on the circumstances of the foul). A successful free throw is worth one point. Invented in 1891 by James A. Naismith at the YMCA Training School in Springfield, Mass.,

basketball quickly became popular throughout the U.S., with games organized at the high school and collegiate level for both sexes. (For the first game, Naismith used as goals two half-bushel peach baskets, which gave

the sport its name.) Women first played the game under a markedly different set of rules. The game developed internationally at a slower pace. The first Olympic basketball contest was held in 1936, and the Federation Internationale de Basketball Amateur (FIB A) introduced world championships for men and women in 1950 and 1953, respectively. In the U.S., high school and collegiate championship tournaments are traditionally held in March and generate considerable excitement. A men’s professional league was organized in 1898 but did not gain much of a following until 1949, when it was reconstituted as the National Basketball Association (NBA). The first women’s professional leagues in the U.S. emerged during the 1970s but failed after a year or two. The current Women’s National Basketball Association (WNBA), owned by the NBA, was organized in 1997. Club and professional basketball outside the U.S. developed rapidly in the latter part of the 20th century. The Basketball Hall of Fame is located in Springfield.

basketry Art and craft of making containers and other objects from interwoven flexible fibres such as grasses, twigs, bamboo, and rushes. It is primarily a functional rather than a decorative art. The type of basketry in a given geographic region is determined by the type of vegetation available there. Numerous Asian, African, Oceanic, and Native American cultures have excelled in basketry.

Baskin, Leonard (b. Aug. 15, 1922, New Brunswick, N.J., U.S. — d. June 3, 2000, Northampton, Mass.) U.S. sculptor and graphic artist. After studying in Europe and the U.S., in 1939 he had his first one-man exhibition in New York City, and he later taught for many years at Smith College. He is known for his bleak portrayals of the human figure. His sculptures in bronze, limestone, and wood are dominated by themes of death, vulnerability, and spiritual decay. In his woodcuts he developed a distinctive linear style, depicting figures resembling those in anatomical charts. Baskin was particularly noted for his memorials, including the Holocaust Memorial (dedicated 1994) in Ann Arbor, Mich.

basking shark Huge, sluggish shark (family Cetorhinidae) named for its habit of floating or slowly swimming at the surface. Possibly comprising more than one distinct species, it inhabits northern and temperate regions of the Atlantic, Pacific, and Indian oceans. It may grow as large as 46 ft (14 m); among fishes, only the whale shark grows larger. Despite its size, the basking shark feeds on plankton. It is gray-brown or blackish, with tiny teeth and very long gill slits. It is generally harmless and is hunted sporadically for fish meal and liver oil.

Basle See Basel

Basque \'bask\ Spanish Vasco Member of a people of unknown origin living in Spain and France along the Bay of Biscay and in the western Pyrenees mountains in the region of the Basque Country. About

850,000 true Basques live in Spain
and another 130,000 in France.
Physically the Basques are similar to
other Western European peoples; the

Basque language, however, is not Indo-European. The Basques have sought autonomy from Spain since the 19th century. A national government was proclaimed in the Spanish Civil War, which saw the brutal bombing of Guernica (1937). After the war, the government and many Basques went into exile as Francisco Franco abolished their special privileges. The Basque separatist movement was rekindled after Franco's death and the establishment of a liberal Spanish monarchy in 1975. Despite the granting of limited autonomy in 1978, the more militant separatists, including the terrorist ETA (Basque Homeland and Liberty), continued a campaign for complete independence.

Basque Country Spanish Pais Vasco VpIs-'bas-koN Euskera Euskadi Autonomous community (pop., 2005 est.: 2,124,846) and his-

basket

The U.S. professional court is shown. The U.S. college court has similar dimensions but line. International courts are slightly smaller and have 20-ft 6-in three-point lines a wider at the boundary line than at the free-throw line. The basket height is 1 0 ft on

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1706, Wolverly, Worcestershire,

Baskerville, detail of a portrait after James Millar, 1 774; in the National Portrait Gallery, London

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torical region, northern Spain. Bounded by the Bay of Biscay, it consists of the modem provinces of Vizcaya (Biscay), Alava, and Guipuzcoa and has an area of 2,793 sq mi (7,234 sq km); its capital is Vitoria-Gasteiz. The Pyrenees Mountains separate it from the Basque Country of France. The Basques who inhabit the region have long sought autonomy. A separatist movement succeeded in regaining Basque autonomy in 1936 under the short-lived Republican government, but autonomy was withdrawn by Francisco Franco in 1937. Though limited autonomy was granted in 1979, a campaign of terrorism against the Spanish government continued. Alava is an agricultural region, while metallurgical industry is concentrated around Bilbao.

Basque Country French Pays Basque \pe-'e-'bask\ Cultural region, extreme southwestern France. It extends from the Anie Peak of the Pyrenees to the coast around Biarritz on the Bay of Biscay. The region has been largely spared the problems associated with Basque separatism in Spain’s Basque Country. Fishing and tourism are economic mainstays.

Basque language Language spoken by an estimated 1,000,000 Basque people living in the Basque Country of north-central Spain and southwestern France. About 200,000 Basques live in other parts of the world. The only remnant of the languages spoken in western Europe before incursions by iNDO-EuROPEAN-speaking peoples, Basque has no known linguistic relatives; linguists call it a language isolate. Its grammar is markedly distinct from that of all other western European languages. Basque is sparsely attested before the 16th century, when the first book in the language was printed (1545), though it has maintained a continuous literary tradition since then.

Basrah, Al- or Basra Port and city (pop., 2003 est.: 1,400,000), southeastern Iraq. It lies at the head of the Shatt al-Arab, about 70 mi (110 km) upstream from the Persian Gulf. Founded in ad 638, it became famous under the ‘Abbasid dynasty; in The Thousand and One Nights it was the city from which Sindbad the Sailor set sail. In the 17th— 1 8th centuries it became a trading centre. Occupied by the British in World War I (1914—18), the town and port underwent many improvements and grew in importance. After World War II (1939-45), the growth of Iraq’s petroleum industry turned Al-Basrah into a major refining centre. It suffered heavy damage in the Iran-Iraq War (1980-90) and the First Persian Gulf War (1990-91) and was the scene of fighting between Iraqi and coalition forces in the Second Persian Gulf War (2003).

bas-relief \,ba-ri-Tef\ or low relief Sculptural form in which figures are carved in a flat surface and project only slightly from the background rather than standing freely. Depending on the degree of projection, reliefs may also be classified as high or medium relief.

bass \'bas\ In zoology, any of numerous fish species, many valued for food or sport. Most are placed in three families (all in the order Perciformes): 400 species of sea bass and grouper; the family Moronidae, which contains about 12 species, including striped and European basses; and sunfishes, including the black and largemouth basses, prized by fishermen. Many other species are also known as bass, including the channel bass (a drum) and the calico bass (a crappie).

bass \'bas\ Lowest musical voice or register. In vocal music, its range is approximately from the second E below middle C to middle C itself. A basso profundo emphasizes a lower register, a basso cantante a some-

what higher one. Outside of Russia, the solo bass voice has generally been relegated to certain standard operatic character roles. The lowest-pitched member of most instrumental families is usually called the bass (bass clarinet, double bass, etc.). In Western tonal music, the bass part is usually second in importance only to the melody, being the chief determiner of harmonic movement, a tendency that became particularly notable after the appearance of the basso continuo c. 1600.

Bass Strait \'bas\ Strait separating Australia from Tasmania. It is 150 mi (240 km) wide at its widest point and 185 mi (298 km) long. It was named in 1798 for the British surgeon-explorer George Bass. Development of its offshore petroleum resources began in the 1960s.

Bassano \ba-'sa-no\, Jacopo orig. Jacopo da Ponte (b. c. 1517, Bassano, republic of Venice-Ai. Feb. 13, 1592, Bassano) Italian painter. He was the most celebrated member of a family of artists from the small town of Bassano, near Venice, where he worked for most of his life. He trained with Bonifacio de’ Pitati in Venice and was influenced by other Venetian painters. He became known for his late Renaissance-style works depicting biblical themes, lush landscapes, and rustic scenes. Four painter

sons continued the Bassano workshop tradition: Francesco (1549-92) and Leandro (1557-1622), both of whom were part of the workshop’s Venetian branch, Giovanni Battista (1553-1613), and Gerolamo (1566-1621). Many products of the workshop were collaborative efforts.

basset hound Centuries-old breed of dog developed in France and maintained, chiefly in France and Belgium, as a hunting dog of the aristocracy. Originally used to trail hares, rabbits, and deer, it has also been used for hunting birds, foxes, and other game. It is a slow, deliberate hunter, with a deep voice and a nose exceeded in keenness only by the bloodhound’s. Short-legged and heavy-boned, the basset hound has long, dangling ears and a short coat in any combination of black, tan, and white. It stands 12-15 in. (30-38 cm) high and weighs 40-60 lbs (18-27 kg).

Basseterre \bas-'ter\ Seaport (pop., 1994 est.: 12,605), Saint Kitts Island. Chief town of Saint Kitts and capital of the federated state of Saint Kitts and Nevis, it lies on the southwestern coast, west of St. John’s, Antigua. Founded in 1627, it serves as a depot distributing merchandise to neighbouring islands.

Bassi Vbas-eV Agostino (b. Sept. 25, 1773, near Lodi, Lombardy, Habsburg crown land — d. Feb. 8, 1856, Lodi) Italian bacteriologist. He attended Pavia University. In 1 807 he began an investigation of the silkworm disease muscardine, which was causing serious economic losses in Italy and France. After 25 years of research, he demonstrated that the disease was contagious and was caused by a microscopic parasitic fungus spread among the silkworms by contact and infected food. He announced his discoveries in 1835 and theorized that many plant, animal, and human diseases are caused by animal or vegetable parasites, thus preceding both

Louis Pasteur and Robert Koch in formulating a germ theory of disease.

basso continuo See continuo

bassoon Principal tenor and bass instrument of the orchestral wood-wind family. Its mouthpiece has a double reed attached to a curved metal crook, which leads to a narrow conical bore that doubles back on itself (to keep its length manageable). It developed from the older curtal (or dulzian) in the 17th century. An agile instrument with a mild tone, it has a range of 7>Vi octaves, starting at B-flat two octaves below middle C. The contrabassoon, a large metal instrument whose tubing doubles back four times, has a range an octave lower.

basswood Any of certain species of linden common to North America. The name refers especially to Tilia americana, found in a vast area of eastern North America but centred in the Great Lakes region, and to T. caroliniana and T georgiana, found in the southeastern U.S.

bast See phloem

Bastet \'bas-,tet\ or Bast or Ubasti In Egyptian religion, a goddess worshiped first as a lioness and later as a cat. Her nature changed after the domestication of the cat c. 1500 bc. She had cults at Bubastis in the Nile delta and at Memphis. In the Late and Ptolemaic periods, large cemeteries of mummified cats were created at both sites, and thousands of bronze statuettes of the goddess were deposited as votive offerings. Bastet is represented as a lioness or a woman with a cat’s head, usually holding a bag, a breastplate, and a sistrum (wire rattle). The Romans carried her cult to Italy.

Bastille \bas-'tel\ Medieval fortress in Paris that became a symbol of despotism. In the 17th— 1 8th centuries, the Bastille was used as a French state prison and a place of detention for important persons. On July 14, 1789, at the beginning of the French Revolution, an armed mob of Parisians captured the fortress and released its prisoners, a dramatic action that came to symbolize the end of the ancien regime. The Bastille was subsequently demolished by the Revolutionary government. Bastille Day (July 14) has been a French national holiday since 1880.

Basutoland See Lesotho

bat Any member of about 900 species (order Chiroptera) of the only mammals to have evolved true flight. Their wings are evolutionary modi-

Basset hound

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fication of the forelimbs, with greatly elongated fingers joined by a membrane that extends down the side of the body. Most bats use echolocation to orient themselves and find prey. Found worldwide, they are particularly abundant in the tropics. Wingspreads vary among species from 6 in. (15 cm) to 5 ft (1.5 m). Nearly all species roost during the day (in caves, crevices, burrows, building, or trees) and feed at night. Most are insectivores, consuming enough insects to affect the balance of insect populations. Others feed on fruit, pollen, nectar, or blood (vampire bats). Some may live more than 20 years. The guano of bats has long been used for agricultural fertilizer. See also free-tailed bat, fruit bat.

Bat Mitzvah See Bar Mitzvah

Bataan Death March \b3-'tan\ (April 1942) Forced march of 70,000 U.S. and Filipino prisoners of war (World War II) captured by the Japanese in the Philippines. From the southern end of the Bataan Peninsula, the starving and ill-treated prisoners were force-marched 63 mi (101 km) to a prison camp. Only 54,000 prisoners lived to reach the camp; up to 10,000 died on the way and others escaped in the jungle. In 1946 the Japanese commander of the march was convicted by a U.S. military commission and executed.

Bataille \ba-'tay\, Georges (b. Sept. 10, 1897, Billom, France — d. July 9, 1962, Paris) French librarian and writer. He trained as an archivist and worked at the Bibliotheque Nationale and at the Orleans library. He wrote a number of novels under pseudonyms before publishing Le Coupable (1944; Guilty) under his own name. His novels, essays, and poetry show a fascination with eroticism, mysticism, violence, and an ideal of excess and waste. In 1946 he founded the influential literary review Critique , which he edited until his death.

Batak \bs-'tak\ Any member of any of several closely related ethnic groups of central Sumatra, Indon. The Batak are descendants of a powerful Proto-Malayan people who until 1825 lived in relative isolation in the highlands surrounding Lake Toba in Sumatra. They have their own written language. In their traditional religion, ancestors, plants, animals, and inanimate objects are considered to possess souls or spirits; today about a third of the 3.1 million Batak adhere to traditional beliefs, while the rest profess Christianity or Islam.

Batavian Republic Republic of the Netherlands after it was conquered by France in 1795. Its government, set up in 1798, was bound to France by alliance. In 1805 Napoleon renamed it the Batavian Commonwealth and placed executive power in the hands of a dictator. In 1 806 it was replaced by the Kingdom of Holland under the rule of Louis Bonaparte; it was incorporated into the French empire in 1810.

bat-eared fox Species (Otocyon megalotis) of large-eared fox found in open, arid areas of eastern and southern Africa. It has 48 teeth (six more than any other canine) and, except for its unusually large ears, looks like the red fox. It grows to a length of about 32 in. (80 cm), including a 12-in. (30-cm) tail, and weighs 7-10 lbs (3-4.5 kg). It lives alone or in small groups and feeds

primarily on insects, especially termites.

Bateman, Hester orig. Hester Needham (b. 1709, London,

Eng. — d. 1794, London) British silversmith. In 1760, after the death of her husband, John Bateman, she took over the family business. Until 1774 she generally executed designs commissioned by other silversmiths. After that time her shop became well known for its tableware, such as spoons, sugar bowls, saltcellars, and teapots. Bateman's designs were restrained and graceful, characterized by beaded edges. In addition to domestic silver, she produced large presentation pieces. See photograph opposite.

Bateson, Gregory (b. May 9, 1904, Grantchester, Eng. — d. July 4, 1980, San Francisco, Calif., U.S.) British-born U.S. anthropologist. Son of British biologist William Bateson, he studied anthropology at Cambridge University but soon thereafter moved to the U.S. His most important book, Naven (1936), was a groundbreaking study of cultural symbolism and ritual based on fieldwork in New Guinea. From 1936 to

Bat-eared fox (Otocyon megalotis)

MARK BOULTON FROM THE NATIONAL AUDUBON SOCIETY COLLECTION/PHOTO RESEARCHERS-EB INC.

1950 he was married to Margaret Mead, with whom he studied the connection between culture and personality, publishing Balinese Character in 1942. His interests broadened to include problems of learning and communication among schizophrenics. His last book, Mind and Nature (1978), synthesized many of his ideas.

Bateson, William (b. Aug. 8, 1861, Whitby, Yorkshire, Eng. — d. Feb. 8, 1926, London) British biologist.

In 1900, while studying inheritance of traits, he was drawn to the research of Gregor Mendel, which explained perfectly the results of his own plant experiments. He was the first to translate Mendel's major work into English. With Reginald Crundall Punnett, he published the results of a series of breeding experiments that not only extended Mendel's principles to animals but also showed that, contrary to Mendel, certain features were consistently inherited together, a phenomenon that came to be termed linkage (see linkage group). In 1908 he became Britain's first professor of genetics, and in 1909 he introduced the term

genetics. He opposed Thomas Hunt Morgan’s theory of chromosomes.

Gregory Bateson was his son. See also Carl Erich Correns; Hugo de Vries; Erich Tschermak von Seysenegg.

Bath City (pop., 1995 est.: 84,000), southwestern England. Situated on the River Avon, it was founded as Aquae Sulis by the Romans, who were attracted to its hot mineral springs. The Anglo-Saxons arrived in the 6th century ad, followed by the Normans c. 1100. In the Middle Ages it was a prosperous centre for the cloth trade. When the Roman baths were rediscovered in 1755, Bath had already revived as a spa; its popularity is reflected in the works of Jane Austen, Richard Brinsley Sheridan, and Tobias Smollett. It was rebuilt and extended in the Palladian style during the 1 8th century. Bath today retains many of its 18th-century structures.

Ba'th Vbath\ Party or Baath Party Arab political party that advocates formation of a single Arab socialist state. It was founded in Damascus, Syria, by Michel 'Aflaq and Salah al-Dln al-Bltar in 1943 and in 1953 merged with the Syrian Socialist Party to form the Arab Socialist Ba'th Party. It espoused nonalignment and opposition to imperialism and colonialism. It gained control of Syria in 1963 after the failure of a short-lived union with Egypt and of Iraq in 1968 after a series of coups there; the Iraqi branch of the party was toppled as a result of the Second Persian Gulf War (2003). The party also has branches in other Middle Eastern countries. See also Pan-Arabism; Hafiz al-Assad; Saddam Hussein.

William Bateson, drawing by Sir William Rothenstein, 191 7; in the National Portrait Gallery, London

COURTESY OF THE NATIONAL PORTRAIT GALLERY, LONDON

Silver coffee pot by Hester Bateman, 1 773-74; in the Victoria and Albert Museum, London.

COURTESY OF THE VICTORIA AND ALBERT MUSEUM, LONDON

batholith Large body of igneous ROCK formed beneath the Earth’s surface by the intrusion and solidification of magma. Batholiths are usually composed of coarse-grained rocks (e.g., granite or quartz diorite) and often have an irregular shape, with side walls that incline steeply. They may have a surface exposure of 40 sq mi (100 sq km) or more and may be 6-9 mi (10—15 km) thick. A well-

known batholith is located in the Sierra Nevada range of California.

Bathory, Stephen See Stephen Bathory

Bathurst See Banjul

Bathurst Island Island, Nunavut, Canada. Located in the Arctic Ocean between Cornwallis and Melville islands, it is 160 mi (260 km) long and 50-100 mi (80-160 km) wide.

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The coastline is fringed with islets, and several islands stretch from its western tip. Discovered in 1819 by Sir William Parry, it was named for Henry Bathurst, 3rd Earl Bathurst.

bathypelagic zone \,bath-i-p9-'la-jik\ Worldwide zone of deep ocean waters, about 3,000-13,000 ft (1,000-4,000 m) below the surface. It is inhabited by a wide variety of marine forms, including eels, fishes, mollusks, and others.

bathyscaphe \'ba-thi-,skaf\ Navigable diving vessel developed by Auguste Piccard (assisted by his son Jacques), designed to reach great depths in the ocean. The first bathyscaphe, the FNRS 2, was built in 1946^18 in Belgium. A later version, the Trieste , was acquired by the U.S. Navy; in 1960 it dived to a record 35,810 ft (10,916 m) in the Mariana Trench. The bathyscaphe consists of two main components: a steel cabin, heavier than water and resistant to sea pressure, to accommodate the observers; and a light container called a float, filled with gasoline, which, being lighter than water, provides the necessary lifting power (replacing cables, which had previously been used to support descending chambers but had proven unreliable at great depths).

batik \b3-'tek\ Method of dyeing textiles, principally cottons, in which patterned areas are covered with wax so that they will not receive colour. Multicoloured effects are achieved by repeating the dyeing process several times, the initial pattern of wax being boiled off and another design applied before redyeing. Wax was applied with bamboo strips in Indonesia, where the technique originated. A small copper pot with a handle and narrow applicator spout for applying the wax came into use in Java by the mid 18th century; a wood-block wax applicator was developed in the 19th century. Dutch traders imported the cloth and the technique to Europe. Today machines for applying wax in traditional Javanese patterns

reproduce the same effects as the hand-dyeing process.

Batiniyyah V.ba-ti-'ne-yoV School of Islamic thought that interpreted religious texts exclusively on the basis of hidden rather than literal meanings. Such interpretation gained currency around the 8th century among esoteric Shiite sects, especially the schismatic Isma'njyyah, who believed that beneath every obvious meaning lay a hidden, true meaning, which the imam was empowered to interpret. While influenced by speculative philosophy and theology, the Batiniyyah remained proponents of esoteric knowledge. Sunnite Muslims condemned the Batiniyyah as enemies of Islam for rejecting literal truth and producing confusion and controversy through their multiple textual readings.

Batista \ba-'tes-ta\ (y Zaldivar), Fulgencio (b. Jan. 16, 1901, Banes, Cuba — d. Aug. 6, 1973, Guadalmina, near Marbella, Spain) Soldier, president, and dictator who twice ruled Cuba (1933-44, 1952-59). Batista worked his way up through the army and came to power as a strongman, ruling first through associates, then as president himself from 1940. During his first term he cultivated the support of the U.S., the army, organized labour, and the civil service, and he achieved gains in the educational system, public works, and the economy as a whole while enriching himself and his associates. He lost the 1944 election but returned by way of an army revolt in 1952. His second rule was a corrupt and brutal dictatorship that set the stage for his overthrow by Fidel Castro on Jan. 1, 1959.

Batlle y Ordonez Vbat-ya-e-or-'thon-yasV Jose (b. May 21, 1856, Montevideo, Uru. — d. Oct. 20, 1929, Montevideo) President of Uruguay (1903-07, 1911-15). The son of a former president of Uruguay, he was involved in politics from the 1880s. His narrow victory in the 1903 presidential election led to a brief civil war, but when he held new elections in 1905 he won again. He stepped down at the end of his term and was reelected in 1911. He inaugurated labour reforms, limited the profits of foreign-owned businesses, encouraged migration, nationalized and developed public works, ended the death penalty, and protected children born out of wedlock. He is credited with transforming Uruguay into a stable, democratic welfare state.

Baton Rouge Vbat-Yi-TiizhV City (pop., 2000: 227,818), capital of Louisiana, U.S. Located on the Mississippi River, it is the state's second-largest city. Settled by the French in 1719, it was named for a red cypress pole that marked a boundary between Indian tribes. The area was ceded to Britain in 1763, then taken by the Spanish in the American Revolution. Spain ceded Louisiana to France in 1800 but tried to retain Baton Rouge at the time of the Louisiana Purchase (1803). In 1810 the city was annexed to the U.S., and it became the state capital in 1849. The capital was transferred to other towns when Baton Rouge was occupied by Federal troops during the American Civil War; in 1882 it regained its capital status. It has deepwater port facilities and is an important petroleum refining centre.

battalion Tactical military organization composed of a headquarters and two or more companies, batteries, or similar units and usually commanded by a field-grade officer such as a lieutenant colonel. The term has been used in nearly every Western army for centuries and has had many meanings. In the 16th- 17th century, it denoted a unit of infantry used in a line of battle and was loosely applied to any large body of men. During the Napoleonic Wars, battalions were fighting units of the French army

under the administrative unit of the regiment. In the armies of the British Commonwealth nations, infantry battalions are tactical units within regiments. The typical U.S. Army battalion is a unit of 800-900 soldiers, divided into a headquarters company and three rifle companies; two to five battalions form the combat elements of a tactical brigade. See also MILITARY UNIT.

Batten berg family or Mountbatten family Family that rose to international prominence in the 19th-20th centuries. The first Battenbergs were a family of German counts that died out c. 1314; the title was revived in 1851. In 1917 the family members who lived in England renounced the German title of prince of Battenberg and adopted Mountbatten as a surname (“mount” being a translation of “Berg”). Prominent members of the family included Philip, duke of Edinburgh, and Louis Mountbatten.

battered woman syndrome Psychological and behavioral pattern displayed by female victims of domestic violence. Explanations that have evolved since the late 1970s include learned helplessness, a “cycle of violence” theory, and a form of post-traumatic stress disorder. The term is a legal concept rather than a psychiatric diagnosis and lacks clearly defined criteria. It has been used to support legal arguments of self-defense, diminished responsibility, or insanity when a woman is accused of murdering or assaulting her batterer, committing a crime under his coercion, or provoking the behaviour the batterer is on trial for. Critics say the term creates a stereotyped image inadequate to describe individual experiences.

battering ram Medieval weapon consisting of a heavy timber with a metal knob or point at the front. Rams were used to beat down the gates or walls of a besieged city or castle. Usually suspended by ropes from the roof of a movable shed, the timber was swung back and forth by its operators so that it banged against the structure under siege. The shed’s roof was covered with animal skins to protect the operators inside it from bombardment with stones or fiery materials.

Battersea enamelware Painted enamelware made by Stephen Theodore Janssen at York House in London’s Battersea district from 1753 to 1756. The ware is composed of soft white enamel over a copper ground. The designs were applied by hand painting or by transfer printing: an impression from an engraved metal plate brushed with enamel colours was made on paper, and the design was then transferred to the object to be decorated. Most of the objects (e.g., snuffboxes, watch cases) were decorated with mottoes, portraits, landscapes, or flowers. The transfer printing technique was first used for large-scale production at Battersea.

battery Any of a class of devices, consisting of a group of electrochemical cells (see electrochemistry), that convert chemical energy into electrical energy; the term is also commonly applied to a single cell of this kind. A wet cell (e.g., a car battery) contains free liquid electrolyte; in a dry cell (e.g., a flashlight battery) the electrolyte is held in an absorbent material. Chemicals are arranged so that electrons released from the battery’s negative electrode flow (see electric current) through a circuit outside the battery (in the device powered by it) to the battery’s positive electrode. The battery’s voltage depends on the chemicals used and the number of cells (in series); the current depends on the resistance in the total circuit (including the battery — and thus on electrode size). Multiple batteries may be connected in series (the positive electrode of one to the negative electrode of the next), which increases total voltage, or in parallel (positive to positive and negative to negative), which increases total

current. Batteries that are not rechargeable include standard dry cells used in flashlights and certain wet cells for marine, mine, highway, and military use. Car batteries, many kinds of dry cells used in cordless appliances, and batteries for certain military and aerospace uses may be recharged repeatedly. See illustration on opposite page.

battery See assault and battery

battlement Parapet (portion above the roof) of the exterior wall of a fortification, consisting of alternating low portions (crenels) and high por-

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tions (merlons). Rooftop defenders would shoot from behind the merlons during times of siege. Medieval battlements were often bracketed out (see corbel) to form a machicolation (overhang) with holes in its floor through which objects could be dropped on encroachers below.

battleship Capital ship of the world’s navies from c. 1860, when it began to replace the wooden-hulled ship of the line, until World War II, when it was superseded by the aircraft carrier. It combined large size, powerful guns, and heavy armour with fairly high speed and great cruising radius. The most powerful could hit targets at a range of more than 20 mi (30 km) and absorb heavy damage while remaining afloat and continuing to fight. It originated in early ironclad vessels with mixed sail and steam propulsion, such as the French armoured frigate Gloire (1859). In 1906 HMS Dreadnought revolutionized battleship design by introducing steam-turbine propulsion and an array of ten 12-in. (305 -mm) guns. In World War II (1939^-5) battleships were used mainly for specialized tasks such as bombarding enemy coastal defenses in amphibious warfare. After the Persian Gulf War (1990—91), the U.S. decommissioned its last two active battleships.

Batu \'ba-tu\ (d. c. 1255, Russia) Grandson of Genghis Khan and founder of the Golden Horde. In 1235 Batu was elected commander in chief of

sulfur

atom

carbon -
anode

metal —
cathode

sodium -

sulfur —

alumina

sodium

atoms

anode

sodium alumina sulfur

The sodium-sulfur (NaS) battery, patented in 1 965 by the Ford Motor Company, has been used in some electric cars. During discharge, the sodium reacts with the ceramic alumina electrolyte, losing electrons, which travel out the anode to the circuit the battery is powering. The ionic sodium then combines with sulfur, which has acquired electrons from the cathode. The reaction is reversible, so the battery can be recharged. The advantage of this battery over other rechargeables (e.g., lead-acid, nickel-cadmium, or nickel-metal hydride batteries) is that it can provide the same amount of power with a smaller, lighter battery. However, since the chemicals must be heated to a molten state (about 325 °C, or 61 7 °F) and pure sodium is very reactive, failure of the battery casing or ceramic electrolyte is potentially dangerous.

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the western part of the Mongol empire and given responsibility for the invasion of Europe. His troops burned and sacked Kiev in 1240, and by the end of 1241 he had conquered Russia, Poland, Bohemia, Hungary, and the Danube valley. Only the death of Ogodei prevented him from invading western Europe. Batu established the state of the Golden Horde in southern Russia, which was ruled by his successors for the next 200 years.

Baudelaire \bod-'ler\, Charles (-Pierre) (b. April 9, 1821, Paris, France — d. Aug. 31, 1867, Paris)

French poet. While a law student he became addicted to opium and hashish and contracted syphilis. His early reckless spending on fine clothes and furnishings led to a life dogged by debt. In 1844 he formed an association with Jeanne Duval, a woman of mixed black and white ancestry who inspired some of his finest poetry. He published a single novel, La fanfarlo, in 1847. His discovery of the works of Edgar Allan Poe in 1852 led to years of work on Poe, which produced many masterly translations and critical articles. His reputation rests primarily on the extraordinary

poetry collection Les fleurs du mal (1857; The Flowers of Evil), which dealt with erotic, aesthetic, and social themes in ways that appalled many of his middle-class readers, and he was accused of obscenity and blasphemy. Though the title became a byword for depravity, the book became perhaps the most influential collection of lyrics published in Europe in the 19th century. His Petits poemes en prose (1868) was an important and innovative experiment in prose poetry. He also wrote provocative essays in art criticism. Baudelaire's later years were darkened by disillusionment, despair, and mounting debt; his death at 46 resulted from syphilis. He is regarded as the earliest and finest poet of modernism in French.

Baudot \bo-'do\, (Jean Maurice) Emile (b. 1845, Magneux, France — d. March 28, 1903, Sceaux) French engineer. In 1874 he patented a telegraph code that by the mid 20th century had supplanted Morse code as the standard telegraphic alphabet. In Baudot's code, each letter is represented by a five-unit combination of current-on or current-off signals of equal duration, providing 32 permutations (sufficient for the Roman alphabet, punctuation, and control of the machine's mechanical functions). Baudot also invented (1894) a distributor system for multiplex (simultaneous) transmission of several messages on the same telegraphic circuit or channel. The baud, a unit of data transmission speed, is named for him.

Baudouin \bod-'waii\ I (b. Sept. 7, 1930, Stuyvenberg Castle, near Brussels, Belg. — d. July 31, 1993, Motril, Spain) King of the Belgians (1951-93). The son of King Leopold III, Baudouin lived with his family under house arrest in German-occupied Belgium during World War II. After postwar exile in Switzerland, Baudouin became king on his father's abdication (195 1). He helped restore confidence in the monarchy after the stormy reign of his father and became a unifying force in a country divided between Flemish- (Dutch-) and French-speaking factions. Because Baudouin and his wife, Fabiola, were childless, he was succeeded by his brother, Albert II.

Baudrillard \bo-dre-'yar\, Jean (b. 1929, Riems, France) French sociologist, philosopher, and social critic. He taught sociology at the University of Paris from 1966 to 1987. He is known for his theories of consumer culture and of the influence of contemporary electronic media, especially television. In a series of works in the 1970s, he applied ideas from semiotics to argue that consumer culture and especially advertising constitute a "code" of images and ideals in terms of which individuals construct their social identities. In works published during the 1980s and '90s, he argued that the exchange of words, images, and other symbols through increasingly pervasive electronic media created a new kind of reality, the "hyper-real," in which symbols become partly constitutive of the reality they serve to represent. An example, according to Baudrillard, is the tele-

Baudelaire, photograph by Etienne Carjat, 1863.

COURTESY OF THE BIBLIOTHEQUE NATIONALE, PARIS

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vision news, which reports about important events in the world but at the same time makes events important by reporting about them. In The Gulf War Did Not Take Place (1991), he contended that the mass-media portrayal of the 1991 war in the Persian Gulf had made that event “unreal.” See also postmodernism.

Baugh Vbo\, Sammy in full Samuel Adrian Baugh (b. March 17, 1914, Temple, Texas, U.S.) First outstanding quarterback of U.S. professional football. He led the NFL in forward passing in 6 of 16 seasons (1937-52) with the Washington Redskins. He also excelled as a punter and as a defensive halfback.

Bauhaus Vbau-,haus\ German "House of Building" (1919-33) Influential, forward-looking German school of architecture and applied arts. It was founded by Walter Gropius with the ideal of integrating art, craftsmanship, and technology. Realizing that mass production had to be the precondition of successful design in the machine age, its members rejected the Arts and Crafts Movement’s emphasis on individually executed luxury objects. The Bauhaus is often associated with a severe but elegant geometric style carried out with great economy of means, though in fact the works produced by its members were richly diverse. Its faculty included Josef Albers, Laszlo Moholy-Nagy, Lyonel Feininger, Paul Klee, Vasily Kandinsky, and Marcel Breuer. The school was based in Weimar until 1925, Dessau through 1932, and Berlin in its final months, when its last director, Ludwig Mies van der Rohe, closed the school in anticipation of the Nazis’ doing so. See also International Style.

Baum \'bam\, L(yman) Frank (b. May 15, 1856, Chittenango, N.Y., U.S. — d. May 6, 1919, Hollywood, Calif.) U.S. writer of children’s books. Baum achieved commercial success with his first book, Father Goose (1899), and followed it the next year with the even more popular Wonderful Wizard of Oz . He wrote 13 more Oz books, which acquired a huge readership. The series was continued by Ruth Plumly Thompson after his death.

bauxite Most important aluminum ore, of varying compositions in which aluminum hydroxide or aluminum oxide predominate (named for Les Baux in southern France, where the ore was identified in 1821). The other constituents are largely iron oxide, silica, and titania. Bauxite has been found in all the continents except Antarctica. Known deposits can supply the world with aluminum for hundreds of years at present production levels.

Bavaria German Bayern Ybl-onA State (pop., 2002 est.: 12,330,000), southern Germany. Conquered by the Romans in the 1st century bc (see Noricum; Raetia), the area was taken by Charlemagne and incorporated into his empire in 788. It became one of the great duchies of the Holy Roman

Empire. Under Maximilian I, Bavaria led the Catholic League in the Thirty Years' War. It was overrun repeatedly in the context of larger wars in the 18th century. It joined the German Empire in 1871, while remaining a kingdom. The king was overthrown in 1918; after a brief period of instability, Bavaria joined the Weimar Republic in 1919. Adolf Hitler had his first power base in Bavaria in the 1920s. It adopted a new constitution in 1946 and became a state of the Federal Republic of Germany in 1949. It has long been Germany’s most Roman Catholic area. Its largest cities are Munich (its capital), Augsburg, and Nurnberg. Notable regions include the Bavarian Alps, the Black Forest, and the Bohemian Forest. Bavaria is famous for the beauty of its rolling landscape and the charm of its villages.

Bavarian Succession, War of the (1778-79) Conflict in which Frederick II of Prussia prevented Joseph II of Austria from acquiring Bavaria. After the death of the Bavarian elector Maximilian Joseph (1727-77), his successor, Charles Theodore (1724-99), ceded Lower Bavaria to Austria. Frederick II responded by declaring war (1778). There was little fighting because each force was concerned with cutting its opponent’s communications and denying it supplies. Short on supplies, soldiers foraged for potatoes; hence, the conflict was nicknamed the “potato war.” In 1779 Austria and Prussia signed a treaty giving Austria a fraction of the territory originally occupied.

Bax, Sir Arnold (Edward Trevor) (b. Nov. 8, 1883, London, Eng. — d. Oct. 3, 1953, Cork, County Cork, Ire.) British composer. Bom into a wealthy family, he was free to compose throughout his life and consequently wrote prolifically. His early works, influenced by the poetry of William Butler Yeats, frequently evoke Celtic legend. His compositions include seven symphonies, the orchestral works Spring Fire (1913), November Woods (1917), and Tintagel (1919), piano sonatas, string quartets, and numerous vocal works.

bay In architecture, any division of a building between vertical lines or planes, especially the entire space included between the centerlines of two adjacent vertical supports. The space between two columns or pilasters, or from pier to pier in a church, including that part of the vaulting (see vault) or ceiling between them, is thus called a bay.

bay Any of several small trees with aromatic leaves, especially the sweet bay, or bay laurel {Laurus nobilis), source of the bay leaf used in cooking. The California laurel (Umbellularia californica) is an ornamental tree also called the bay tree. The bay rum tree, or simply bay (Pimenta racemosa), has leaves and twigs that yield, when distilled, oil of bay, which is used in perfumery and in the preparation of bay rum, a fragrant cosmetic and medicinal liquid.

bay Semicircular or nearly circular concavity, similar to a gulf but usually smaller. Bays may range from a few hundred yards to several hundred miles from side to side. They are usually located where easily eroded rocks, such as clays and sandstones, are bounded by harder, more erosion-resistant formations of igneous rocks, such as granite, or hard calcareous rocks, such as massive limestones. Some bays form excellent harbours.

Bay Vbl\, Laguna de Lake, central Luzon, Philippine Islands. Located southeast of Manila, the lake, about 32 mi (52 km) long, is the largest in the Philippines. Its outlet is the Pasig River. It is dotted with islands, the largest being densely settled Talim.

Bay of Pigs invasion (April 17, 1961) Abortive invasion of Cuba directed by the U.S. Central Intelligence Agency and carried out by Cuban exiles. The invasion was intended to spark a rebellion that would topple Fidel Castro, whose communist regime was considered a threat to U.S. interests in the region. The invasion began with the bombing of Cuban military bases; two days later a force of about 1,500 landed at several sites along the coast, including the Bay of Pigs. The rebellion never materialized, the invasion force was quickly defeated, and more than 1,100 men were imprisoned. The result was a huge propaganda victory for Castro and a severe embarrassment for the administration of U.S. president John F. Kennedy.

Bayamon \,bI-a- , mon\ Municipality (pop., 2000: 224,044), northeastern Puerto Rico, part of the metropolitan area of San Juan. Puerto Rico’s first settlement, Caparra, was founded nearby in 1508 by Spanish explorer Juan Ponce de Leon. Established as a town in 1772, it is now a manufacturing centre for clothing, furniture, automotive parts, and metal products. Educational institutions include Bayamon Central University.

Bayard Vba-3rd\, Thomas Francis (b. Oct. 29, 1828, Wilmington, Del., U.S. — d. Sept. 28, 1898, Dedham, Mass.) U.S. statesman, diplomat, and lawyer. Born into a prominent political family, he succeeded his father as U.S. senator from Delaware (1869-85). He served as secretary of state (1885-89) and as ambassador to Britain (1893-97), the first U.S. representative to Great Britain to hold that rank. A champion of arbitration, he was critical of the aggressive position of Pres. Grover Cleveland in the dispute with Britain over the Venezuelan boundary (1895).

Baybars I or Baibars Vbl-bars\ (b. c. 1223, north of the Black Sea — d. July 1, 1277, Damascus, Syria) Most eminent sultan of the MamlOk dynasty. A Kipchak Turk, he was sold as a slave (mamluk) after a Mongol invasion in the 1240s. He ended up in the service of the sultan of Egypt’s AyyObid dynasty, who gave him military training. In 1250 his army captured the Crusader king Louis IX, and he and other mamluk officers murdered the last Ayyubid sultan, establishing the Mamluk dynasty. He distinguished himself against an invading Mongol force at the Battle of ‘Ayn Jalut (1260) and soon thereafter took the throne, when he murdered the third Mamluk sultan. As sultan, he rebuilt the Syrian fortresses that had been destroyed by the Mongols and built up the sultanate’s armaments. He seized territory from the Crusaders that they were never to recover. He harried the Mongols in Persia, attacking their allies (the Christian Armenians) and forging an alliance with the Mongols of the Golden Horde against them. He sent military expeditions into Nubia and Libya. He had diplomatic relations with James I of Aragon, Alfonso X of Leon and Castile, and Charles of Anjou, as well as with the Byzantine emperor. At home he built canals and the great mosque in Cairo that bears his name and established efficient postal service between Cairo and Damascus. The Sirat Baybars, a folk account purporting to be his life story, is still popular in the Arabic-speaking world.

bayberry Any of several aromatic shrubs and small trees of the genus Myrica in the bayberry family (Myricaceae), but especially M. pennsyl-

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vanica, also called candleberry, which has grayish waxy berries that, upon boiling, yield the wax used in bayberry candles. The California bayberry, or California wax myrtle (M. calif ornica), is used as an ornamental on sandy soils in warm climates.

Bayer AG German chemical and pharmaceutical company. Founded in 1863 by Friedrich Bayer (1825-1880), it now operates plants in more than 30 countries. Bayer has originated scores of pharmaceuticals, chemicals, and synthetic materials; it was the first developer and marketer of aspirin (1899); of Prontosil, the first sulfa drug (1935); and of polyurethane (1937). Bayer was part of the chemical cartel IG Farben from 1925 to 1945, when the latter was dissolved by the Allies; it was reestablished as an independent company in 1951. Its most noteworthy drug of the 1990s was the antibiotic Cipro. Its headquarters are in Leverkusen.

Bayeux \ba-'yce\ Tapestry Medieval embroidered tapestry depicting the Norman Conquest. Woven in woolen threads of eight colours on coarse linen, it is about 231 ft (70 m) long by about 20 in. (50 cm) wide. It consists of 79 consecutive scenes, with Latin inscriptions and decorative borders. Stylistically it resembles English illuminated manuscripts. It was probably woven c. 1066, within a few years of the conquest, and was possibly commissioned by Odo, bishop of Bayeux, brother of William I (the Conqueror). The most famous of all pieces of needlework, it hung for centuries in the cathedral in Bayeux (Normandy) and now hangs in the tapestry museum there.

English axman in combat with Norman cavalry during the Battle of Hastings, detail from the 1 1 th-century Bayeux Tapestry, Bayeux, France.

GIRAUDON/ART RESOURCE, NEW YORK

Bayezid \bI-3-'zed\ I (b. c. 1360 — d. March 1403?, Ak§ehir, Anatolia) Sultan of the Ottoman Empire (1389-1402). After succeeding his father, Murad II (d. 1389), Bayezid expanded Ottoman control of the shrinking Byzantine Empire by conquering vast tracts of territory in the Balkans, thus securing his rule south of the Danube. From 1391 to 1398 he blockaded Constantinople (modem Istanbul), and he crushed the Hungarian Crusaders at the Battle of Nicopolis in 1396. He then sought to widen Ottoman control over Anatolia. Defeated by Timur at the Battle of Ankara in 1402, Bayezid died in captivity. He was succeeded by his son, Mehmed I, after an interregnum of some 10 years.

Bayezid \,bI-3-'zed\ II (b. December 1447/January 1448?, Demotika, Thrace, Ottoman Empire — d. May 26, 1512, Demotika) Sultan who consolidated control of the Ottoman Empire begun by his father, Mehmed II. After taking the throne in 1481, he reversed his father’s policies of expropriating Muslim religious properties and rejected his pro-European orientation but continued the policy of territorial conquest. Under him, Herzegovina came under direct Ottoman control, and the Ottoman hold over the Crimea and Anatolia was strengthened. He fought the Safavid

dynasty in the east, the MamlOk dynasty in the south, and the Venetians in the west. At home he built mosques, colleges, hospitals, and bridges and supported jurists, scholars, and poets. He abdicated in favour of his son, Selim I, a month before his death.

Baykal, Lake See Lake Baikal

Bayle \'bel\, Pierre (b. Nov. 18, 1647, Carla-le-Comte, France — d. Dec. 28, 1706, Rotterdam, Neth.) French philosopher. Educated at a Jesuit school, he converted to Roman Catholicism but later reverted to his original Calvinist faith. His religious views led to his losing professorships first at Sedan and later at Rotterdam. He was convinced that philosophical reasoning led to universal skepticism, but that nature compelled mankind to adopt beliefs on the basis of blind faith. The bulk of his Historical and Critical Dictionary (1697) consists of quotations, anecdotes, commentaries, and erudite annotations that cleverly undo whatever orthodox Christian beliefs the articles express; and it was condemned by religious authorities. Bayle’ s oblique method of subversive criticism was later adopted by the contributors to the Encyclopedie of Denis Diderot.

Baylis, Lilian (Mary) (b. May 9, 1874, London, Eng. — d. Nov. 25, 1937, London) British theatrical manager and founder of the Old Vic. She assisted her aunt, Emma Cons, in the operation of the Royal Victoria Hall and Coffee Tavern, and on Cons’ s death in 1912 she converted the hall into the Old Vic, which became famous for its Shakespearean productions. Between 1914 and 1923 the theatre staged all of William Shakespeare’s plays, a feat no other playhouse had attempted. In 1931 she took over the derelict Sadler’s Wells Theatre and made it a centre of opera and ballet.

Bayliss, Sir William Maddock (b. May 2, 1860, Wolverhampton, Staffordshire, Eng. — d. Aug. 27, 1924, London) British physiologist. He and Ernest H. Starling studied nerve-controlled blood-vessel contraction and dilation and discovered the peristaltic wave. In 1902 they showed that dilute hydrochloric acid mixed with partly digested food activates a chemical in the duodenum that they called secretin, because it stimulates secretion of pancreatic juice. This marked the discovery of hormones, a term the men coined. Bayliss also showed how the enzyme trypsin was formed from inactive trypsinogen and measured precisely the time it took to digest protein. His recommendation of gum-saline injections for wound shock saved many lives in World War I.

Baylor, Elgin (b. Sept. 16, 1934, Washington, D.C., U.S.) U.S. basketball player. At 6 ft 5 in. (1.96 m) Baylor played for the Minneapolis (later Los Angeles) Lakers of the NBA from 1958 to 1971. A high-scoring and acrobatic forward, Baylor averaged 27.4 points for his career, placing him in the top five of all time.

bayonet Short, sharp-edged, sometimes pointed weapon, designed for attachment to the muzzle of a firearm. According to tradition, it was developed in Bayonne, France, early in the 17th century and soon spread throughout Europe. The earliest design, the plug bayonet, was inserted into the muzzle of a musket, thus preventing the musket from being fired until the bayonet was removed. Later designs, including the socket bayonet invented by Sebastien Le Prestre de Vauban (1688), slipped it over the muzzle. Repeating firearms greatly reduced its combat value. By World War I it had become an all-purpose knife.

bayou \'bl-ii\ Still or slow-moving section of marshy water, usually a creek, secondary watercourse, or minor river that is a tributary of another river or channel. It may occur in the form of an oxbow lake. Bayous are typical of Louisiana’s Mississippi River delta.

Bayreuth \bI-'roit\ City (pop., 2001 est.: 74,500), east-central Germany. It is situated northeast of Nurnberg. Founded in 1194 under Bishop Otto II of Bamberg, it came under the burgrave of Nurnberg in 1248-1398 and the margraves of Brandenburg-Kulmbach in 1603-1769. The margraves patronized the arts and commissioned many Baroque buildings that still exist. It was ceded to Prussia in 1791, captured by Napoleon in 1806, and passed to Bavaria in 1810. Composer Richard Wagner settled there in 1872 and designed the Festspielhaus, where Wagner festivals have been held since its opening in 1876. Manufactures include machinery, textiles, chemicals, pianos, porcelain, and glassware.

Bazin \ba-'za n \, Henri-Emile (b. Jan. 10, 1829, Nancy, France — d. Feb. 7, 1917, Dijon) French engineer. As an assistant to H.-P.-G. Darcy (1803-1858), he completed his program of tests on resistance to water flow in channels after Darcy’s death, producing the classic study of the subject. He later studied the problem of wave propagation (see wave) and the contraction of fluid flowing through an orifice. In 1854 he enlarged the Canal de Bourgogne and made it profitable for commercial navigation. In 1 867 he suggested the use of pumps for dredging rivers, leading to the construction of the first suction dredgers.

bazooka Shoulder-type rocket launcher adopted by the U.S. Army in World War II. It consisted of a smoothbore steel tube, originally about 5

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ft (1.5 m) long, open at both ends and equipped with a hand grip, shoulder rest, trigger mechanism, and sights. Officially named the M9A1 Rocket Launcher, it was called bazooka after the crude horn of that name used by a popular radio comedian. It was developed chiefly for attacking tanks and fortified positions at short range. The U.S. Army abandoned it during the Vietnam War in favour of lighter- weight antitank weapons.

BBC in full British Broadcasting Corp. Publicly financed broadcasting system in Britain. A private company at its founding in 1922, it was replaced by a public corporation under royal charter in 1927. The BBC World Service began in 1932, and by the 1990s was broadcasting programs in 38 languages to 120 million people worldwide. BBC television service, which kept its monopoly on television service until a commercial channel began broadcasting in 1954, introduced regular color broadcasts in Europe in 1967. The BBC radio monopoly ended in 1972. The BBC today offers five radio networks and two national television channels.

BBS See bulletin-board system

BCS theory Comprehensive theory that explains the behaviour of superconducting materials. It was developed in 1957 by John Bardeen, Leon Cooper, and J. Robert Schrieffer (b. 1931), whose surname initials provide its name. Cooper discovered that electrons in a superconductor are grouped in pairs (Cooper pairs) and that the motions of all the pairs within a single superconductor constitute a system that functions as a single entity. An electric voltage applied to the superconductor causes all Cooper pairs to move, forming an electric current. When the voltage is removed, the current continues to flow because the pairs encounter no opposition. See also superconductivity.

beach Sediments that accumulate along sea or lake shores. One type of beach occurs as a sediment strip bordering a rocky or cliffy coast. A second type is the outer margin of a marine plain. The third type consists of namow sediment barriers stretching for dozens or even hundreds of miles parallel to the general direction of the coast. These barriers separate lagoons from the open sea and generally are dissected by tidal inlets. Certain sediment forelands, such as spits, points, and tombolos (which connect an island with a mainland), occasionally are called beaches.

Beach, Amy Marcy orig. Amy Marcy Cheney known as Mrs. H.H.A. Beach (b. Sept. 5, 1867, Henniker, N.H., U.S. — d. Dec. 27, 1944, New York, N.Y.) U.S. composer and pianist. A precociously brilliant musician, she performed as soloist with major orchestras in the U.S. and Europe. As a composer she was devoted to German Romanticism rather than American themes or sources. Her best-loved works were her songs. Her Gaelic Symphony (1894) was the first symphony by an American woman. Other works include a piano concerto (1899), the choral pieces The Chambered Nautilus (1907) and Canticle of the Sun (1928), the opera Cabildo (1932), and a piano quintet (1907).

Beach Boys U.S. rock group. The band was formed in California in 1961 by brothers Brian Wilson (b. 1942) on keyboards and bass, Dennis Wilson (1944-83) on drums, and Carl Wilson (1946-98) on guitar; their cousin Mike Love (b. 1941) on drums; and Alan Jardine (b. 1942) on guitar. Within a year they launched a string of surfing-oriented hits marked by close vocal harmony, including “Surfin’ Safari” and “California Girls.” By 1966 they had released more than 10 albums, including Pet Sounds (1966), considered their best. Despite Brian Wilson’s reclusiveness due to stress- and drug-related breakdowns, the band continued to make recordings into the 1980s and toured into the 1990s.

beach flea See sand flea

bead Small object, usually pierced for stringing. It may be made of virtually any material — wood, shell, bone, seed, nut, metal, stone, glass, or plastic — and is worn or affixed to another object for decorative or, in some cultures, magical purposes. The earliest Egyptian beads (c. 4000 bc) were made of stone, feldspar, lapis lazuli, carnelian, turquoise, hematite, or amethyst and were variously shaped (sphere, cone, shell, animal head). By 3000-2000 bc, gold beads in tubular shapes were in use. From the Middle Ages to the 18th century, trade in beads was enormous. Today the richness of beadwork varies with fashion.

Beadle, George Wells (b. Oct. 22, 1903, Wahoo, Neb., U.S. — d. June 9, 1989, Pomona, Calif.) U.S. geneticist. He earned his Ph.D. from

Cornell University. While studying Drosophila, he realized that genes must influence heredity chemically and designed a complex technique to

determine the nature of those effects, showing that something as apparently simple as eye colour results from a long series of chemical reactions, which are affected by genes. With Edward L. Tatum, he found that the total environment of a bread mold could be varied so that researchers could locate and identify mutations relatively easily, concluding that each gene determines the structure of a specific enzyme, which in turn allows a single chemical reaction to proceed. For the “one gene, one enzyme” concept, they shared a 1958 Nobel Prize with Joshua Lederberg. Beadle later served as president of the University of Chicago (1960-68).

beadwork Ornamental work in beads. In the Middle Ages beads were used to embellish embroidery work. In Renaissance and Elizabethan England, clothing, purses, fancy boxes, and small pictures were adorned with beads. In the 19th-20th century beadwork proliferated in dress decoration. Beads are used as ornamentation on a variety of objects (clothing, masks, weapons, dolls) in many cultures, including the Native American, African, and Oceanic.

beagle Breed of small hound, popular as both a pet and a hunter. It looks like a small foxhound, with large brown eyes, hanging ears, and a short coat that is usually a combination of black, tan, and white. Beagles are solidly built and heavy for their height. Two sizes are recognized: those standing less than 13 in. (33 cm) and weighing about 18 lbs (8 kg), and those standing about 15 in.

(38 cm) and weighing about 30 lbs (13.5 kg). Beagles generally excel as rabbit hunters and are typically alert and affectionate.

Beagle Channel Channel, extreme southern South America. Separating the main islands of Tierra del Fuego from smaller islands in the archipelago, it is about 150 mi (240 km) long and 3-8 mi (5-13 km) wide. The eastern portion forms part of the Chile-Argentina border, while the western portion lies entirely within Chile. It was named for the British ship HMS Beagle, in which Charles Darwin explored the area.

beak or bin Stiff, projecting oral structure of birds and turtles (both of which lack teeth) and certain other animals (e.g., cephalopods and some insects, fishes, and mammals). The term bill is preferred for the beak of a bird, which is composed of upper and lower jaws covered by a horny sheath of skin, with the nostrils on top, usually at the base. The shapes and sizes of bills are adapted for obtaining food, preening, building nests, and other functions; they range from the long, slim bills of nectar-sipping hummingbirds to the sturdy, curved, nut-cracking bills of parrots.

Beaker culture Late Neolithic and early Bronze Age culture of northern and western Europe. The people are known for a group of distinctive bell-shaped earthenware beakers decorated with toothed stamps, probably

used in rituals of consumption. The Beaker people buried their dead in simple graves but also in megalithic tombs in western Europe. They used the bow and arrow as well as copper daggers and spearheads. As they searched for gold and copper, they spread metallurgy into other parts of Europe. They eventually mixed with the Battle-Ax culture and spread from central Europe to eastern England.

beam In building construction, a horizontal member spanning an opening and carrying a load. The load may be a wall above the opening (see post-and-beam system) or it may be a floor or roof. Beams may be of wood, steel or other metals, reinforced or prestressed concrete, plastic, or even brick with steel reinforcement. For weight reduction, metal beams are I-shaped, having a thin vertical web and thicker horizontal flanges where greater stress occurs. A joist is any of a series of small parallel beams supporting a floor or roof. See also girder, spandrel.

bean Seed or pod of certain leguminous plants (see legume). The mature seeds of the principal food beans, except soybeans, are similar in composition, though they differ widely in eating quality. Rich in protein and providing moderate amounts of iron and vitamins B x and B 2 , fresh or dried beans are used worldwide for cooking. Varieties differ greatly in size, shape, colour, and tenderness of the immature pods. The common string, snap, or green bean (. Phaseolus vulgaris) of Central and South American origin is the dominant edible-podded bean in the U.S. , second to the soy-

Beagle

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bean in importance. Third in importance is the broad, or fava, bean (Vicia faba), the principal bean of Europe. The lima bean (P. limensis), of Central American origin, is commercially important in few countries outside the Americas. The scarlet runner bean (P coccineus) is native to the New World tropics and is grown in Europe for its attractive flowers and fleshy immature pods. The mung bean, or green gram (P. aureus), is native to India and grown extensively in the Orient for food.

Bean, Roy (b. 1825?, Mason county, Ky., U.S. — d. March 16, 1903, Langtry, Texas) U.S. justice of the peace and saloonkeeper. He left Kentucky in 1 847 and moved from town to town, killing at least two men in duels, before settling in Texas. During the American Civil War he first served with Confederate regulars and then was a blockade runner in Texas, becoming so prosperous that he was able to live at ease in San Antonio for some 16 years. In 1882 he moved to a site on the lower Pecos River that he named for Lillie Langtry, opened a saloon, and dispensed hard, commonsensical, and prankish rulings as an unofficial magistrate, styling himself the “law west of the Pecos.”

bear Generally massive, short-legged mammals constituting the family Ursidae. Bears are the most recently evolved carnivore, found in Europe, Asia, and the Americas. Closely related to the dog and the raccoon, most bears climb with ease and are strong swimmers. As a family, they are omnivores, but dietary preferences vary among species (the polar bear feeds mainly on seals, the spectacled bear on vegetation, etc.). Though they do not truly hibernate, bears often sleep fitfully through much of the winter. They live 15-30 years in the wild but much longer in captivity. They have been hunted as trophies, for hides, and for food. See also black bear; brown bear; sun bear.

bear cat See lesser panda

Bear Flag Revolt Short-lived rebellion in 1846 by American settlers in California against Mexican authorities. In June a small group captured Sonoma, a settlement north of San Francisco, and declared independence, raising a flag that featured a grizzly bear. Capt. John C. Fremont soon arrived to give his support and was elected to head the “republic.” In July U.S. forces occupied San Francisco and Sonoma and claimed California for the U.S. The bear flag later became the state flag.

bear grass Either of two species of North American plants that make up the genus Xerophyllum, in the lily family. The western species, X. tenax, also known as elk grass, squaw grass, and fire lily, is a smooth, light-green mountain perennial with a stout, unbranched stem and grasslike, rough-edged leaves at the bottom. It flowers at five to seven years, bearing a large cluster of small, creamy white flowers at the top of the stem. The turkey beard (X. asp hodelo ides) of southern North America is a similar plant that grows in dry pine barrens. In the southern and southwestern U.S., the name bear grass is given to various kinds of yucca and to the camas (Camassia scilloides) and the aloelike Dasylirion texanum.

bear market In securities and commodities trading, a declining market. A bear is an investor who expects prices to decline and, on this assumption, sells a borrowed security or commodity in the hope of buying it back later at a lower price, a speculative transaction called short-selling. See also bull market.

bearberry Flowering, prostrate, evergreen shrub (Arctostaphylos uva-ursi) of the heath family, growing widely throughout North America in rocky and sandy woods and open areas. It has woody stems that are often 5-6 ft (1.5-1. 8 m) long. Roots develop from stem joints, and the plant spreads, forming a broad, massive ground cover. The foliage turns bronzy in winter. The white, pink, or pink-tipped flowers are shaped like a narrow-mouthed bell. The berries are red.

Beard, Charles A(ustin) (b. Nov. 27, 1874, near Knightstown, Ind., U.S. — d. Sept. 1, 1948, New Haven, Conn.) U.S. historian. Beard taught at Columbia University (1904-17) and cofounded New York’s New School for Social Research (1919). He is best known for iconoclastic studies of the development of U.S. political institutions, emphasizing the dynamics of socioeconomic conflict and change and analyzing motivational factors in the founding of institutions. His works include An Economic Interpretation of the Constitution of the United States (1913), claiming that the Constitution was formulated to serve the economic interests of the founders; The Economic Origins of Jeffersonian Democracy (1915); and, with his wife, Mary R. Beard (1876-1958), The Rise of

American Civilization (1927).

Beard, James (b. May 5, 1903, Portland, Ore., U.S. — d. Jan. 23, 1985, New York, N.Y.) U.S. culinary expert and cookbook author. In 1945 he became the first chef to demonstrate cooking on network television. Through his Greenwich Village cooking school he influenced such future chefs as Julia Child and Craig Claiborne (b. 1920 — d. 2000). He championed simple American and English dishes and wrote one of the first serious books on outdoor cooking. His more than 20 cookbooks include James Beard's American Cookery (1972) and Beard on Bread (1973).

Bearden, Roma re (Howard) (b. Sept. 2, 1914, Charlotte, N.C., U.S. — d. March 11, 1988, New York, N.Y.) U.S. painter. He studied with George Grosz at the Art Students League and Columbia University. After military service in World War II, he attended the Sorbonne and traveled in Europe. During this time he achieved recognition for his complex, semiabstract collages of photographs and painted paper on canvas. The narrative structure of his work is clear; aspects of African American culture, including ritual, music, and family, were his predominant themes. By the 1960s Bearden was recognized as the preeminent collagist in the U.S. He is regarded as one of the most important African American artists of the 20th century.

Beardsley, Aubrey (Vincent) (b. Aug. 21, 1872, Brighton, Sussex, Eng. — d. March 16, 1898, Menton, Fr.) British illustrator. His only formal training was a few months of evening classes at the Westminster School of Art. His style was based on the work of Edward Burne-Jones and Japanese woodcuts, and he quickly became a master of the curvilinear black-and-white ornamental illustration popularized by the Art Nouveau movement. In 1893 he illustrated an edition of Sir Thomas Malory's Le Morte Darthur, and in 1 894 he achieved notoriety with his erotic illustrations for the English version of Oscar Wilde's Salome. He became art editor and illustrator of the new quarterly The Yellow Book that same year. He died at age 25 of tuberculosis.

bearing In machine construction, a connector (usually a support) that permits the connected members to rotate or to move in a straight line relative to one another. Often one of the members is fixed, and the bearing acts as a support for the moving member. Most bearings support rotating shafts against either transverse (radial) or thrust (axial) loads. To minimize friction, the contacting surfaces in a bearing may be separated by a film of oil or gas; these are sliding bearings (see oil seal). In ball bearings and roller bearings, the surfaces are separated by balls or rollers.

bearing wall or load-bearing wall Wall that carries the load of floors and roof above in addition to its own weight. The traditional masonry bearing wall is thickened in proportion to the forces it has to resist: its own weight, the dead load of floors and roof, the live load of people, as well as the lateral forces of arches, vaults, and wind. Such walls may be much thicker toward the base, where maximum loads accumulate. Bearing walls may also be framed and sheathed or constructed of reinforced concrete.

Bearn \ba-'am\ Historical region and former province, southwestern France. It was bounded by Gascony and the Pyrenees; its capital was Pau. It formed part of Aquitania under the Romans; it was later devastated by the Vandals and Visigoths. Held as the countship of Bearn by the future

Henry IV, it became a holding of the French crown when he became king in 1589. In the 16th century Pau was an important cultural centre under the patronage of Margaret of Angouleme.

Beas River \'be-,as\ ancient Hyphasis River, northwestern India. One of the “five rivers” that give the Punjab its name, it rises in the Himalayas in central Himachal Pradesh state and flows south and southwest for some 290 mi (470 km) to the Sutlej River in western Punjab state. It was the approximate limit of Alexander the Great’s invasion of India in 326 bc.

beat In physics, the pulsation resulting from a combination of two waves of slightly different frequency. Beat frequency is the difference between the frequencies of the combining waves. When the interfering frequencies are in the audible range, the beats are heard as alternating soft and loud pulses. The human ear can detect beats with frequencies up to 10 hertz, or 10 beats per second. Piano tuners listen for beats when comparing the pitch of a tuning fork to that of a vibrating string; when no beats are heard, the fork and string are at the same frequency. Ultrasonic or inaudible frequencies can be superimposed to produce audible beats, allowing the detection of vocal sounds produced by bats or dolphins.

Beat movement American social and literary movement of the 1950s and ’60s. It is associated with artists’ communities in San Francisco, Los

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Angeles, and New York. Its adherents expressed alienation from conventional society and advocated personal release and illumination through heightened sensory awareness and altered states of consciousness. Beat poets, including Lawrence Ferlinghetti, Allen Ginsberg, Gregory Corso (1930-2001), and Gary Snyder, sought to liberate poetry from academic refinement, creating verse that was vernacular, sometimes sprinkled with obscenities, but often powerful and moving. Jack Kerouac and William S. Burroughs developed an unstructured, spontaneous, sometimes hallucinatory approach to prose writing that was designed to convey the immediacy of experience. The Beat movement had faded by c. 1970, though its influence continued to be felt decades later.

Beatles British rock group that came to personify the counterculture of the 1960s. Its principal members, all born in Liverpool, Eng., were Paul McCartney, John Lennon, George Harrison, and Ringo Starr. The group began with the pairing of McCartney and Lennon in 1956; Harrison joined in 1957, and Stu Sutcliffe and Pete Best later. In 1960 they adopted the name the Beatles. In 1962 they signed a recording contract and replaced Best with Starr (Sutcliffe had left the group in 1961). The release in 1962-63 of such songs as “Please Please Me” and “I Want to Hold Your Hand” made them England’s most popular rock group, and in 1964 “Beatlemania” struck the U.S. Originally inspired by Chuck Berry, Elvis Presley, Little Richard, and Buddy Holly, among others, their direct, energetic songs kept them at the top of the pop charts. Their long hair and tastes in

dress were influential throughout the world, as were their experimentation with hallucinogenic drugs and Indian mysticism and their involvement with the politics of peace. From 1965 to 1967 the Beatles' music rapidly evolved, becoming increasingly subtle, sophisticated, and varied — ranging from ballads such as "Yesterday" to the psychedelic hard rock of "Tomorrow Never Knows." Their public performances ended in 1966. Albums such as Rubber Soul (1965), Revolver (1966), and The Beatles ("White Album," 1968) set new trends in rock. In 1967 they produced Sgt. Pepper's Lonely Hearts Club Band, an album novel for its conception as a dramatic whole, use of electronic music, and character as a studio work not reproducible onstage. They appeared in the films A Hard Day's Night (1964) and Help! (1965). The group dissolved in 1970. In 1988 the Beatles were inducted into the Rock and Roll Hall of Fame, and Lennon (1994), McCartney (1999), and Harrison (2004) were also inducted as solo performers.

Beaton, Sir Cecil (Walter Hardy) (b. Jan. 14, 1904, London, Eng. — d. Jan. 18, 1980, Broadchalke, Salisbury, Wiltshire) British photographer and designer. When he received his first camera at age 1 1 , he began making portraits of his sisters. In the 1920s he became staff photographer at Vanity Fair and Vogue. In Beaton's exotic and bizarre portraits, the sitter is only one element of an overall decorative composition dominated by flamboyant backgrounds. His photographs of the siege of Britain were published in Winged Squadrons (1942). After the war he designed costumes and stage sets, including those for the movies Gigi (1958) and My Fair Lady (1964).

Beatrix \ba-a-'treks\ (Wilhelmina Armgard) (b. Jan. 31, 1938, Soestdijk, Neth.) Queen of The Netherlands. Beatrix went into exile with her family when the Germans invaded The Netherlands in World War II, and she spent the war years in Britain and Canada. In 1965 her betrothal to a German diplomat sparked controversy because of his past membership in the Hitler Youth and the German army. They were married in 1966, and the hostility waned with the births of the first male heirs in the house of Orange since 1890. Beatrix became queen in 1980 after the abdication of her mother, Juliana.

Beatty Vbat-e\, (Henry) Warren orig. Henry Warren Beaty

(b. March 30, 1937, Richmond, Va.,

U.S.) U.S. film actor, producer, director, and screenwriter. He studied acting with famed coach Stella Adler in New York and made his film

debut in Splendor in the Grass (1961). He later starred in and produced the influential film Bonnie and Clyde (1967). Often cowriting, directing,

or producing his own films, he later starred in Shampoo (1975), Heaven Can Wait (1978), Reds (1981, Academy Award for direction), and Bulworth (1998).

Beaubourg Center See Pompidou Center

Beaufort Sea Vbo-fortX Part of the Arctic Ocean northeast of Alaska, northwest of Canada, and west of Banks Island in the Arctic Archipelago. Its surface area is about 184,000 sq mi (476,000 sq km), its average depth is 3,239 ft (1,004 m), and its greatest depth is 15,360 ft (4,680 m). It is frozen over almost year-round; only in August and September does the ice break up. The Mackenzie River flows into the sea; the chief settlement is Prudhoe Bay, Alaska.

Beauharnais \bo-ar-'ne\, Alexandre, viscount de (b. May 28,

1760, Martinique — d. June 23, 1794, Paris, France) French politician and general, first husband of Josephine. A liberal noble, he became a prominent figure during the French Revolution. He presided over the Constituent Assembly in 1791, served with gallantry in the army, and was named general in chief of the Army of the Rhine in 1793. He was guillotined during the Reign of Terror, largely because he was a noble. He was the father of Eugene and Hortense de Beauharnais and the grandfather of Napoleon III.

Beauharnais, Eugene de (b. Sept. 3, 1781, Paris, France — d. Feb. 21, 1824, Munich, Bavaria) French administrator and general. Son of Josephine and Alexandre, viscount de Beauharnais, he became a useful military aide to his stepfather, Napoleon. In 1804 he received the title of prince and was appointed archchancellor of state. He was named Napoleon's viceroy in Italy (1805), where he reorganized public finances, built roads, and introduced the French legal system. As commander of the Italian army, he fought admirably in various conflicts. In 1814 he held out in Italy against the Austrians and the Neapolitans but was forced to conclude an armistice. He retired to the Bavarian court of his wife's family.

Beauharnais, (Eugenie-) Hortense de (b. April 10, 1783, Paris, France — d. Oct. 5, 1837, Arenenberg, Switz.) French-bom queen of Holland (1806-10). Daughter of Josephine and Alexandre, viscount de Beauharnais, and stepdaughter of Napoleon, Hortense married Napoleon's brother, Louis Bonaparte. When he became king of Holland, she was named queen. The marriage was unhappy but produced three children, including the future Napoleon III. When Napoleon was exiled in 1814, Hortense became the centre of Bonapartist intrigue, and her support of Napoleon during his return led to her banishment from France in 1815, after which she settled in Switzerland.

Beaujolais X.bo-zho-'laX Region in northern Rhone and northeastern Loire departments, east-central France. It is located east of the Massif Central and west of the Saone River. The region is wooded and supports local forestry; its highest point is Mount Saint-Rigaud, elevation 3,310 ft (1,009 m). East of the mountain are the limestone escarpments of the Cote Beaujolaise, which support a world-famous red wine industry.

Beaujoyeulx \bozh-wa-'yce\, Balthazar de orig. Baltazarini di Belgioioso (b. 16th century, Piedmont region — d. 1587, Paris, Fr.) Italian-born French composer and choreographer. In 1555 he left Italy for Paris and joined the court of Catherine de Medicis as a violinist. There he

organized unofficial court fetes and became valet de chambre to the royal family. In 1581 he staged the lavish Ballet comique de la reine\ considered the first ballet, it was emulated by other European courts and was the precursor of developments in ballet for the next century.

Beaumarchais X.bo-mar-'shaX, Pierre-Augustin Caron de (b.

Jan. 24, 1732, Paris, France — d. May 18, 1799, Paris) French playwright. Son of a watchmaker, he invented a clockwork mechanism and became embroiled in lawsuits over its patent; a series of witty pamphlets he wrote in his defense established his reputation as a writer. His comedy The Barber of Seville (1772) was kept off the stage for three years because it criticized the aristocracy. His Marriage of Figaro (1784) similarly censured the nobility and it, too, was initially banned. The plays became famous operas by Gioacchino Rossini and Wolfgang Amadeus Mozart, respectively. He founded the Societe des Auteurs (1777) to enable playwrights to obtain royalty payments. His wealth led, ironically, to his temporary imprisonment during the French Revolution, an event his plays were sometimes said to have sparked.

Beatrix of The Netherlands.

COURTESY OF THE ROYAL NETHERLANDS EMBASSY;
PHOTOGRAPH, MAX KOOT

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Beaumont Vbo-.mantA City (pop., 2000: 113,866), southeastern Texas, U.S. Lying at the head of navigation on the Neches River, it is connected to the Gulf of Mexico by the Sabine-Neches Canal and is a major port of entry. It was founded in 1835. When Spindletop, the first major oil field in Texas, was discovered in 1901, the city grew rapidly. With Port Arthur and Orange, it forms the “Golden Triangle” petrochemical and industrial complex.

Beaumont \'bo- 1 mant\, Francis (b. c. 1585, Grace-Dieu, Leicestershire, Eng. — d. March 6, 1616, London) British playwright. He is known chiefly for the 10 very popular plays on which he collaborated with John Fletcher (1579-1625) c. 1606—13. These included the tragicomedies The Maides Tragedy, Phylaster, and A King and No King. Forty other plays attributed to them were later found to have been written by others. Their independent work includes Beaumont’s poetry and his parody The Knight of the Burning Pestle (1607) and Fletcher’s pastoral The Faithful Shepherdess (1608). After Beaumont retired in 1613, Fletcher collaborated with other playwrights, possibly including William Shakespeare, with whom he may have written King Henry the Eighth and The Two Noble Kinsmen.

Beaumont, William (b. Nov. 21, 1785, Lebanon, Conn., U.S. — d.

April 25, 1853, St. Louis, Mo.) U.S. surgeon. He served many years as an army surgeon. When treating a trapper whose abdomen had been perforated by a shotgun blast, Beaumont collected gastric juice for analysis and showed that it contained hydrochloric acid, which supported his belief that digestion was a chemical process. He also reported on the effects of different foods on the stomach and established alcohol as a cause of gastritis.

Beauregard Vbo-ro-.gardV P(ierre) G(ustave) T(outant) (b. May

28, 1818, near New Orleans, La., U.S. — d. Feb. 20, 1893, New Orleans) U.S. military leader. He graduated from West Point in 1838 and served in the Mexican War. After Louisiana seceded in 1861, he resigned his commission and became a general in the Confederate army. He commanded the forces that bombarded Fort Sumter, S.C., was on the field at the First Battle of Bull Run (1861), and assumed command at the Battle of Shiloh after the death of Gen. Albert Sidney Johnston (1862). He conducted the defenses of Charleston, S.C., and Richmond, Va. Though a capable commander, his penchant for questioning orders sometimes bordered on insubordination. After the war he quarreled with other generals' accounts of his role.

Beauvoir Vbo-.vwarV, Simone (Lucie-Ernestine-Marie-Bertrand) de (b. Jan. 9, 1908, Paris, France — d. April 14, 1986, Paris) French writer and feminist. As a student at the Sorbonne, she met Jean-Paul Sartre, with whom she formed a lifelong intellectual and romantic bond. She is known primarily for her treatise The Second Sex (1949), a scholarly and passionate plea for the abolition of what she called the myth of the "eternal feminine"; the book became a classic of feminist literature. She also wrote four admired volumes of autobiography (1958-72), philosophical works that explore themes of existentialism, and fiction, notably The Mandarins (1954, Prix Goncourt). The Coming of Age (1970) is a bitter reflection on society's indifference to the elderly.

Beaux-Arts \bo-'zar\ style or Second Empire style or Second Empire Baroque Architectural style developed at the Ecole des Beaux-Arts in Paris. It enjoyed international dominance in the late 19th century (see Second Empire) and rapidly became an official style for many of the new public buildings demanded by expanding cities and their national governments. Beaux-Arts buildings are typically massive and have a symmetrical plan with rooms arranged axially, profuse Classicist detail, and pavilions that extend forward at the ends and centre. Among the most admired Beaux-Arts structures is the Paris Opera.

beaver Either species of the aquatic rodent family Castoridae (genus Castor), both of which are well known for building dams. Beavers are heavyset and have short legs and large, webbed hind feet. They grow as large as 4 ft (1.3 m) long, including the 1-ft (30-cm) tail, and as heavy as 66 lb (30 kg). Beavers build their dams of sticks, stones, and mud in small rivers, streams, and lakes, often producing sizable ponds. With their powerful jaws and large teeth, they can fell medium- size trees,

whose branches they use in their dams and whose tender bark and buds they eat. One or more family groups share a dome-shaped stick-and-mud lodge built in the water, with tunnel entrances below water level. American beavers (C. canadensis) range from northern Mexico to the Arctic. Their prized pelts stimulated the exploration of western North America, and by 1900 beavers were trapped to near extinction. Eurasian beavers (C. fiber) are now found in only a few locations, including the Elbe and Rhone drainages of Europe. The mountain beaver of the Pacific Northwest is unrelated.

Beaverbrook (of Beaverbrook and of Cherkley), Maxwell Aitken, 1st Baron orig. William Maxwell Aitken known as Lord Beaverbrook (b. May 25, 1879, Maple, Ont., Can. — d. June 9, 1964, near Leatherhead, Surrey, Eng.) Canadian-British politician and newspaper proprietor. After making a fortune in Montreal as a financier, he moved to England and became active in politics as a Conservative. Beginning in 1916, he took over or founded newspapers, including the London Daily Express, Sunday Express, and Evening Standard. Idiosyncratic and very successful, he became a “press lord” and a champion of individual enterprise and British imperial interests. He held various high government appointments, including positions in the British Cabinet during both World Wars, but he never fully achieved the political power he sought.

Bebel Vba-bolN, August (b. Feb. 22, 1840, Deutz, near Cologne, Ger. — d. Aug. 13, 1913, Passugg, Switz.) German socialist and writer. A turner by trade, Bebel joined the Leipzig Workers’ Educational Association (1861) and became its chairman (1865). Influenced by the ideas of Wilhelm Liebknecht, in 1869 he helped found the Social Democratic Labour Party (later the Social Democratic Party) and became its most influential and popular leader for more than 40 years. He served in the Reichstag in 1867, 1871—81, and 1883-1913. He spent a total of nearly five years in prison on such charges as “libel of Bismarck.” He wrote a number of works, including Woman and Socialism (1883), a powerful piece of Social Democratic propaganda.

Bebey, Francis (b. July 15, 1929, Douala, Camer. — d. May 28, 2001, Paris, France) Cameroonian-born French writer and singer-songwriter. After studying in Paris and New York City, he settled in Paris in 1960. He worked for radio stations and then for UNESCO, researching and documenting traditional African music. Meanwhile, he also composed and recorded his own highly experimental music that often incorporated Latin American, Western, and African elements. Because of this, he is sometimes considered “the father of world music.” He also wrote two books about African music and several works of fiction.

bebop or bop Jazz characterized by harmonic complexity, convoluted melodic lines, and frequent shifting of rhythmic accent. In the mid- 1940s, a group of musicians, including Dizzy Gillespie, Thelonious Monk, and Charlie Parker, rejected the conventions of swing to pioneer a self-consciously artistic extension of improvised jazz, which set new technical standards of velocity and harmonic subtlety. Two genres grew out of bebop in the 1950s: the delicate, dry, understated approach that came to be known as cool jazz, and the aggressive, blues-

tinged earthiness of hard bop.

Beccafumi N.bek-s-'fii-meV
Domenico orig. Domenico di
Giacomo di Pace known as
Mecherino \,mak-ka-'re-no\ (b. c.

1484, Cortina, Republic of
Venice — d. May 1551, Siena,

Republic of Siena) Italian painter
and sculptor active in Siena. He
adopted the name of his patron,

Lorenzo Beccafumi. In 1510 he went
to Rome to study the work of Raphael
and Michelangelo. In 1512 he
returned to Siena, where most of his
best work can be found. He is noted
for his sense of fantasy and creation
of striking light effects, as in The
Birth of the Virgin (c. 1543). He

The Birth of the Virgin, panel painting
by Domenico Beccafumi, c. 1 543; in
the Pinacoteca Nazionale, Siena, Italy.

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painted decorations for the Siena town hall (1529-35) and executed
designs for the marble pavement of Siena Cathedral. He is considered the
outstanding Sienese painter of the Mannerist style.

Beccaria \,bak-ka-'re-3\, Cesare (b. March 15, 1738, Milan — d. Nov.
28, 1794, Milan) Italian criminologist and economist. He became an inter-
national celebrity in 1764 with the publication of Crime and Punishment,
the first systematic statement of principles governing criminal punish-
ment, in which he argued that the effectiveness of criminal justice
depended more on the certainty of punishment than on its severity. The
book greatly influenced criminal-law reform in western Europe. In later
years, Beccaria lectured at Milan’s Palatine School and served as a pub-
lic official, dealing with such issues as monetary reform, labour relations,
and public education.

Bechet \bo-'sha\, Sidney (b. May 14, 1897, New Orleans, La.,

U.S. — d. May 14, 1959, Paris, France) U.S. saxophonist. He took up the clarinet at age six, later switching to the more powerful soprano saxophone. His emergence as a soloist from the New Orleans tradition of collective improvisation (see Dixieland) established his reputation in the mid-1920s. He produced a large, warm tone with a wide and rapid vibrato. His mastery of drama and his use of critically timed deviations in pitch ("note bending") had a long-lasting influence, because they were absorbed by his disciple Johnny Hodges. From the late 1940s he was based in Paris.

Bechtel Vbek-UlX, Stephen D(avison) (b. Sept. 24, 1900, Aurora, Ind., U.S. — d. March 14, 1989, San Francisco, Calif.) U.S. construction engineer and president (1936-60) of W.A. Bechtel Co. and its successor, Bechtel Corp. He became a vice president in the San Francisco-based family firm of W.A. Bechtel Co. in 1925. In 1937 he and John McCone formed Bechtel-McCone Corp., a builder of refineries and chemical plants. The companies built ships and made aircraft parts during World War II. After the war, the newly formed Bechtel Corp. became one of the world's largest construction and engineering firms, building pipelines in Canada, the Middle East, and elsewhere and constructing power plants all over the world. The Bechtel companies helped construct the Hoover Dam, the Alaska oil pipeline, and the city of Al-Jubayl in Saudi Arabia. Bechtel retired as its president in 1960 but remained senior director of what became known as the Bechtel Group.

Bechuanaland See Botswana

Beck, Ludwig (b. June 29, 1880, Biebrich, Ger. — d. July 20, 1944, Berlin) German general. After serving with the army general staff in World War I, he was later chief of the general staff (1935—38). He opposed Adolf Hitler's occupation of the Rhineland and resigned to protest the decision to conquer Czechoslovakia. He helped plan the unsuccessful July Plot to assassinate Hitler; when it failed, Beck committed suicide.

Beckenbauer, Franz (b. Sept. 11, 1945, Munich, Ger.) German football (soccer) player. He is credited with inventing the modern attacking sweeper position. Nicknamed "Der Kaiser," Beckenbauer is the only man to both captain and manage World Cup- winning teams (1974 and 1990, respectively). He spent most of his career with Bayern Munich (1958—77), leading the team to three European Cup championships (1974-76) and four national titles. He was named European Footballer of the Year in 1972 and 1976. After brief stints in New York and Hamburg, he retired in 1984 and turned to managing.

Becker, Boris (Franz) (b. Nov. 22, 1967, Leimen, W.Ger.) German tennis player. He left school in the 10th grade to concentrate on tennis. In 1985 he became the youngest winner (at 17) of the Wimbledon's men's singles title and the youngest ever to win a men's grand-slam tournament, as well as the only unseeded player and the first German ever to win the title. He was victorious at Wimbledon again in 1986 and 1989 and also won singles titles at the 1989 U.S. Open and the 1991 and 1996 Australian Open.

Becker, Gary S(tanley) (b. Dec. 2, 1930, Pottsville, Pa., U.S.) U.S. economist. He studied at Princeton University and the University of Chicago. As a professor at Columbia University and the University of Chicago, he applied the methods of economics to aspects of human behaviour previously considered the domain of sociology and demography. In Human Capital (1964) and A Treatise on the Family (1981), he advanced

the theory that rational economic choices, based on self-interest, govern most human activities, even apparently noneconomic activities such as the formation of families. He won the Nobel Prize in 1992.

Becket, Saint Thomas or Thomas a Becket (b. c. 1118, Cheapside, London, Eng. — d. Dec. 29,

1170, Canterbury, Kent; canonized 1173; feast day December 29) Archbishop of Canterbury (1162-70).

The son of a Norman merchant, he served as chancellor of England (1155-62) under Henry II. whose entire trust he won. A brilliant administrator, diplomat, and military strategist, he aided the king in increasing the royal power. Resistant to the Gregorian reform movement that asserted the autonomy of the church, Henry hoped to reinforce royal control of the church by appointing Becket archbishop of Canterbury in 1162. Becket, however, embraced his new duties devoutly and opposed royal power in the church, especially proclaiming the right of offending clerics to be tried in ecclesiastical courts. The king issued the Constitutions of Clarendon (1164) listing royal rights over the church, and he summoned the archbishop to trial. Becket fled to France and remained in exile until 1170, when he returned to Canterbury and was murdered in the cathedral by four of Henry's knights, traditionally said to be acting in response to the king's angry words. Becket' s tomb, which was visited by Henry in an act of penance, became a site of pilgrimage.

Beckett, Samuel (Barclay) (b. April 13?, 1906, Foxrock, Co. Dublin, Ire. — d. Dec. 22, 1989, Paris,

France) Irish playwright. After studying in Ireland and traveling, he settled in Paris in 1937. During World War II he supported himself as a farmworker and joined the underground resistance. In the postwar years he wrote, in French, the narrative trilogy Molloy (1951), Malone Dies (1951), and The Unnamable (1953). His play Waiting for Godot (1952) was an immediate success in Paris and gained worldwide acclaim when he translated it into English.

Marked by minimal plot and action, existentialist ideas, and humour, it

typifies the Theatre of the Absurd. His later plays, also sparsely staged, abstract works that deal with the mystery and despair of human existence, include Endgame (1957),

Krapp's Last Tape (1958), and Happy Days (1961). In 1969 he was awarded the Nobel Prize.

Beckford, William (b. Sept. 29, 1760, London, Eng. — d. May 2, 1844, Bath, Somerset) English dilettante, novelist, and eccentric. He is remembered for his gothic novel Vathek (1786), about an impious voluptuary who builds a tower so high that he challenges Muhammad in heaven and so brings about his own fall to the kingdom of the prince of darkness; though unevenly written, the story is full of invention and bizarre detail. Beckford and his family were forced to leave England for 10 years by a scandal involving a youth. On his return he built Fonthill Abbey, the most sensational building of the English Gothic Revival, whose own 270-ft (82-m) tower collapsed several times.

Beckmann \'bek-,man\. Max (b. Feb. 12, 1884, Leipzig, Ger. — d. Dec. 27, 1950, New York, N.Y., U.S.) German Expressionist painter and graphic artist. After training at the conservative Weimar Academy, in 1903 he moved to Berlin and joined the Berlin Sezession. His experience as a medical orderly in World War I changed his outlook, and his work became full of horrifying imagery, with deliberately repulsive colours and erratic forms. He considered his work to be a combination of brutal realism and

Martyrdom of Thomas Becket, illustration from an English psalter, c. 1 220; in the British Library.

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Samuel Beckett, 1 965.

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Becknell > bedstraw I 187

social commentary. In 1933 the Nazis declared his art "degenerate" and forced him to resign his professorship at the Stadel School of Art in Frankfurt. In 1937 he fled to Amsterdam, and in 1947 he moved to the U.S., where he taught in St. Louis, Mo., and New York City.

Becknell \'bek-n 3 l\, William (b. 1796?, Amherst county, Va., U.S. — d. April 30, 1865, Texas) U.S. trader. After settling in Missouri, he became involved in trade with the Southwest. When the Spanish prohibition on trade with New Mexico was lifted in 1821, he followed the customary route through the Colorado Rocky Mountains south to Santa Fe, where he sold his goods at great profit. The next year he pioneered a new route through the mountains of northeastern New Mexico that became known as the Santa Fe Trail. In the mid- 1830s he moved to Texas, where he fought for Texas's independence.

Beckwourth, Jim orig. James Pierson Beckwith (b. April 26, 1798, Virginia, U.S. — d. 1867?, Denver, Colo.) U.S. mountain man. Bom a slave, the son of a white man and a slave woman, he was taken by his father to St. Louis and set free. In 1823-24 he was hired by trading expeditions in the Rocky Mountains. He married a series of Indian women and lived among the Crow for about six years. During the California gold rush (1848) he established a route through the Sierra Nevada. In California he met Thomas D. Bonner, who in 1856 published many of Beckwourth's stories and recollections.

Becquerel \be-'krel\, (Antoine-) Henri (b. Dec. 15, 1852, Paris, France — d. Aug. 25, 1908, Le Croisic) French physicist. His grandfather, Antoine-Cesar (1788-1878), was one of the founders of the field of electrochemistry, and his father, Alexandre-Edmond (1820-91), made important studies of light phenomena. Henri likewise studied phosphorescent materials as well as uranium compounds and employed photography in his experiments. He is remembered for his discovery of radioactivity, which occurred when he found that the element uranium (in a sample of pitchblende) emitted invisible rays that could darken a photographic plate. His 1901 report of a burn caused by a sample of Marie Curie's radium that he carried in his vest pocket led to investigations by physicians and ultimately the medical use of radioactive substances. In 1903 he shared a Nobel Prize for Physics with the Curies. The unit of radioactivity, the becquerel (Bq), is named for him.

bed Piece of furniture on which a person may recline or sleep. Beds of simple construction appear in medieval manuscripts, as do more decorative beds with carving and inlay, embroidered coverlets, and elaborate hangings. The canopy, or tester, was introduced in the 15th century. In the 1820s the development of coiled springs fitted into mattresses revolutionized the bed. In the Middle East beds consisted of rugs piled up on the floor. In China raised and canopied beds were used 2,000 years ago.

The traditional Japanese bed (futon) consists of quilted padding and a coverlet arranged on the floor.

bedbug Any member of approximately 75 species of nocturnal insects (family Cimicidae) that feed by sucking the blood of humans and other warm-blooded animals. The

reddish brown adult is broad and flat and less than 0.2 in. (4-5 mm) long.

Among the most cosmopolitan of human parasites, they are found in every kind of dwelling. They digest meals slowly; adults have lived for at least a year without food. Though the bite is irritating, it is not known to transmit diseases to humans.

bedding plant Plant that is grown, usually in quantity, in pots or flats in a greenhouse or similar structure, and that is intended to be transplanted to a flower garden, hanging basket, window box, or other outdoor planter. Most bedding plants are annuals. They are transplanted outdoors after all danger of frost has passed. Some important bedding plants are impatiens, marigolds, and petunias.

Bede, Saint known as the Venerable Bede (b. 672/673, traditionally Monkton in Jarrow, Northumbria [Eng.] — d. May 25, 735, Jarrow; feast day May 25) Anglo-Saxon theologian, historian, and chronologist. Raised in a monastery, he was ordained a priest at age 30. He is best known for his Ecclesiastical History of the English People (732?), tracing Britain's history from 55 bc to ad 597, a source vital to the history of the conversion to Christianity of the Anglo-Saxon tribes in Britain. His method of dating events from the time of Christ's birth (ad) came into general use through the popularity of the Historia ecclesiastica and two works on chronology.

Bedford City (pop., 1995 est.: 81,000), southeast-central England. The administrative seat of Bedfordshire, it lies on the River Ouse northwest of London. It was a Roman fording station and a Saxon town. It was recaptured by the Anglo-Saxons from the Danes in 914. John Bunyan is thought to have written A Pilgrim's Progress while imprisoned there in the 17th century.

Bedfordshire Vbed-ford-.shhA Administrative (pop., 2001: 381,571), geographic, and historic county, southeast-central England. Much of the county is occupied by the River Ouse valley; its capital is Bedford. Settled c. 1800 bc by the Beaker culture, the valley was resettled by the Romans in the 1 st— 5th centuries ad. First mentioned as a political unit in 1010, the county has survived virtually unchanged within its present boundaries. Its architectural masterpiece is Woburn Abbey, seat of the dukes of Bedford.

Bedlington terrier Breed of dog. It was developed in the 19th century in Northumberland, Eng., and named for Bedlingtonshire, a mining district in the area. Initially established as a fighting dog and hunter of vermin, the breed later became a popular pet. Lamblike in appearance, it has an arched back, a topknot, and a thick, curly coat that is blue-gray, deep reddish brown, or pale sandy,

often with tan markings. The breed stands 15-16 in. (38-40 cm) tall and weighs 22-24 lbs. (10-11 kg).

Bedouin \'bed-win\ Any member of a community of Arabic- speaking desert nomads of the Middle East.

Ethnically, the Bedouin are identical to other Arabs. Bedouin traditionally have made their living by animal husbandry, and social rank among them is determined by the animals that they herd: camel nomads enjoy the greatest status, followed by sheep and goat herders and, finally, cattle nomads. Traditionally, Bedouin would migrate into the desert during the rainy season and return to culti- vated areas during the dry season, but since World War II (1939 — 45) the governments of many countries have nationalized their range lands, and conflicts over land use have arisen.

Many Bedouin have since adopted sedentary ways of life; most, how- ever, retain pride in their nomadic heritage.

bedstraw Any low perennial her- baceous plant of the genus Galium , in the madder family, found in damp woods and swamps and along stream banks and shores. Bedstraws bear finely toothed, often needle-shaped leaves in whorls of four to eight; clus- ters of small green, yellow, or white flowers; and fruit composed of two rounded nuts joined together. Northern bedstraw (G. boreale), marsh bed- straw (G. palustre), and goosegrass (G. aparine) are common throughout Europe and have become naturalized in parts of North America. Sweet

Great Bed of Ware, carved, inlaid, and painted wood, English, late 1 6th century; in the Victoria and Albert Museum, London.

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Bedbug (Cimex lectularius) magnified 5 x

WILLIAM E. FERGUSON

Bedlington terrier

SALLY ANNE THOMPSON/EB INC.

Bedouin with a young goat in central Qatar

M. ERICSON/OSTMAN AGENCY

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woodruff (G. odoratum) smells like freshly mown HAY; its dried shoots are used in perfumes, sachets, and beverages. The roots of several species yield a red dye.

bee Any of some 20,000 insect species belonging to the superfamily Apoidea (order Hymenoptera), including the familiar bumblebee.

Adults range in size from about 0.08 to 1.6 in. (2 mm-4 cm). Bees are related to wasps, but, unlike wasps, which can eat other insects, most bees are entirely dependent on flowers for their food. Male bees are usually short-lived and never collect pollen; female bees make and provision the nest and usually have special anatomical structures for carrying pollen. Most species are solitary. The so-called killer bee, an Africanized subspecies of Apis mellifera (see honeybee), reached the U.S. from Mexico c. 1990; killer bees react quickly and attack in number. See also Karl von Frisch.

bee balm Any of 12 North American annual or perennial plants in the genus Monarda, variously known as bergamot, horsemint, and bee balm. They belong to the mint family and have showy flowers. Wild bergamot (M fistulosa) has a minty aroma. The more sharply scented Oswego tea (M didyma ; a bergamot variety) is native to eastern North America but is widely cultivated elsewhere.

beech Any of several different types of trees, especially about 10 species of deciduous ornamental and timber trees constituting the genus Fagus (family Fagaceae), native to temperate and subtropical regions of the Northern Hemisphere. About 40 species of superficially similar trees,

known as false beech (genus Nothofagus), are native to cooler regions of the Southern Hemisphere. A beech of the family Fagaceae is tall, round-headed, and wide-spreading, with smooth, steel-gray bark and toothed, shiny green leaves. The American beech (F. grandifolia), native to eastern North America, and the European beech {F. sylvatica), found throughout England and Eurasia, are the most widely known species. Both are economically important timber trees, often planted as ornamentals. Beech wood is durable under water and is valued for indoor use, tool handles, and shipping containers. The nuts provide forage for game animals, are used in fattening poultry, and yield an edible oil. Beeches are slow-growing and may live 400 years or more.

Beecham, Sir Thomas (b. April 29, 1879, St. Helens, Lancashire, Eng. — d. March 8, 1961, London) British conductor. He was born to an aristocratic family and was self-taught as a conductor. Devoted to broadening British musical tastes, he created the Beecham Symphony Orchestra in 1909. In 1932 he founded the London Philharmonic Orchestra and in 1947 the Royal Philharmonic Orchestra; he also founded opera companies. Though he had significant gaps in his technique, he was an incomparable interpreter of the music he loved, especially that of Wolfgang Amadeus Mozart; of his contemporaries, he particularly championed Richard Strauss and Frederick Delius.

Beecher, Catharine (Esther) (b. Sept. 6, 1800, East Hampton, N.Y., U.S. — d. May 12, 1878, Elmira, N.Y.) U.S. educator who popularized and shaped a conservative movement to both elevate and entrench woman's role in the domestic sphere. Daughter of the minister and temperance activist Lyman Beecher and sister of Harriet Beecher Stowe and Henry Ward Beecher, she helped found the Hartford Female Seminary (1823) and other organizations devoted to women's education. Her popular Treatise on Domestic Economy (1841) helped standardize domestic practices while reinforcing the belief that a woman's proper place was in the home.

Beecher, Henry Ward (b. June 24, 1813, Litchfield, Conn., U.S. — d. March 8, 1887, Brooklyn, N.Y.) U.S. Congregational clergyman. The son of a minister, he was the brother of Harriet Beecher Stowe and Catharine Esther Beecher. After graduating from Amherst College and later studying at Lane Theological Seminary, he served as pastor to congregations in Indiana. In 1847 he was called to Plymouth Church in Brooklyn. A famous orator and one of the most influential preachers of his time, he opposed slavery and supported women's suffrage, Charles Darwin's theory of evolution,

and scientific biblical criticism. He gained unfavourable publicity in 1874 when he was put on trial for adultery, but he was acquitted and returned to his church.

bee-eater Any of about 25 species of brightly coloured birds (family Meropidae) that feed on bees, wasps, and other insects. They are found throughout tropical and subtropical Eurasia, Africa, and Australasia (one species occasionally reaches the British Isles). Bee-eaters range in length from 6 to 14 in. (15-35 cm).

Their bill is moderately long, slightly downcurved, and pointed. Their brilliant plumage is usually predominantly green, but many species are partially coloured with red, yellow, blue, or purple.

beef Flesh of mature cattle, as distinguished from veal, the flesh of calves. The best beef is obtained from steers (castrated males) and heifers (female cows that have not calved). Tenderness and flavour are improved by aging; in one common method, the carcass is hung for about two weeks at approximately 36 °F (2 °C). The world’s primary beef producers and consumers are the U.S., the European Union, Brazil, China,

Argentina, and Australia. Grading standards are relatively uniform; in the U.S., grades range from prime and choice to utility and canner. Beef provides protein and B vitamins; it also contains saturated fat, an excess of which can contribute to heart disease and other health problems. Beef is not eaten by Hindus because of the sacred status of the cow.

beehive tomb or tholos \'tho-,las\ Large, beehive-shaped ceremonial tomb, sometimes built into the side of a hill. The Treasury of Atreus, a surviving tholos (c. 1300-1250 bc) of the Mycenaean civilization, is a pointed dome built up of stepped blocks of conglomerate masonry cut and polished to give the impression of a true vault. A small side chamber contained the burials, while the main chamber was probably reserved for ritual use.

beekeeping or apiculture Va-po-.kol-chorX Care and manipulation of honeybees to enable them to produce and store more honey than they need so that the excess can be collected. Beekeeping is one of the oldest forms of animal husbandry. Early efforts at collecting the honey required destroying the hive; modern beekeepers use an extractor that empties the cells of the honeycomb without damaging them. To collect honey, beekeepers need a veiled helmet for protection, a tool for cutting comb, and a smoker for tranquilizing the bees. Maintaining the hive includes protecting the colony against diseases, parasites, and predators.

beer Alcoholic beverage made usually from malted barley, flavoured with hops, and brewed by slow fermentation. Known from ancient times, beer was especially common in northern climates not conducive to grape cultivation for wine. It is produced by employing either a bottom-fermenting yeast, which falls to the bottom of the container when fermentation is completed, or a top-fermenting yeast, which rises to the surface. Lager beers (from lagern, “to store”), of German origin, are bottom-fermented and stored at a low temperature for several months; most are light in colour, with high carbonation, medium hop flavor, and alcohol content of 3-5% by volume. Top-fermented beers, popular in Britain, include ale, stout, and porter; they are characterized by a prominent head of released

carbon dioxide, a sharper and more strongly hopped flavour than lagers, and an alcohol content of 4-6.5% by volume. See also malt.

Beer Hall Putsch or Munich Putsch \'puch\ (Nov. 8-9, 1923) Unsuccessful attempt by Adolf Hitler to start an insurrection in Germany against the Weimar Republic. On Nov. 8, 1923, Hitler and his men pushed

Leaf-cutting bee (Anthidium)

M.W.F. TWEEDIE FROM THE NATURAL HISTORY PHOTOGRAPHIC AGENCY-EB INC.

Henry Beecher, photographed by Napoleon Sarony

THE GRANGER COLLECTION

Bee-eater (Merops a pi aster).

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their way into a right-wing political meeting in a Munich beer hall and obtained agreement that the leaders there should join in carrying the “revolution” to Berlin. The next day, some 3,000 Nazis marched toward the Marienplatz but were met by police gunfire. Hitler was subsequently sentenced to five years in prison for treason; he served only eight months, time he spent writing Mein Kampf.

Beerbohm, Sir (Henry) Max(imilian) (b. Aug. 24, 1872, London, Eng. — d. May 20, 1956, Rapallo, Italy) English caricaturist, writer, and dandy. His sophisticated drawings and parodies were unique in capturing, usually without malice, whatever was pretentious, affected, or absurd in his famous and fashionable contemporaries. His first literary collection, The Works of Max Beerbohm (1896), and his first book of drawings. Cari-catures of Twenty-five Gentlemen (1896), were followed by the charming fable The Happy Hypocrite (1897) and his only novel, Zuleika Dobson (1911), a burlesque of Oxford life. His story collection Seven Men (1919) is considered a masterpiece.

Beersheba City (pop., 1999 est.: 163,700), southern Israel. Historically

it marked the extreme southern limit of Palestine, hence the biblical phrase “from Dan to Beersheba” (Dan is in far northern Israel). It fell to the Arabs in the 7th century and to the Ottoman Empire in the 16th century. It was long a watering place for the nomadic Bedouin tribes of the Negev desert. Held by the British from 1917, it became part of Israel in 1948. It has since developed as the administrative, cultural, and industrial centre of the Negev.

Beery, Wallace (Fitzgerald) (b. April 1, 1885, Kansas City, Mo., U.S. — d. April 15, 1949, Los Angeles, Calif.) U.S. film and stage actor. He initially worked in the circus and later in the choruses of New York City theatrical productions. After playing the lead in The Yankee Tourist, he spent several years as a dramatic actor in touring and stock companies. He started his film career in 1913, first as a comedian in Mack Sennett’s Keystone comedies. He is best known for his performances as dim-witted, but endearing, toughs in such films as The Champ (1931, Academy Award), Min and Bill (1931), and Tugboat Annie (1933).

beeswax Commercially useful wax secreted by worker honeybees to make the cell walls of the honeycomb. A bee consumes an estimated 6-10 lbs (3-4.5 kg) of honey for each pound of the wax it secretes in small flakes from glands on the underside of its abdomen. After honey removal, the comb is melted to produce the beeswax, which ranges from yellow to almost black. It is used for candles (often for churches), artificial fruit and flowers, modeling wax, and as an ingredient of furniture and floor waxes, leather dressings, waxed paper, lithographic inks, cosmetics, and ointments.

beet Cultivated form of the plant Beta vulgaris of the goosefoot family (Chenopodiaceae), one of the most important vegetables. Four distinct types are cultivated: the garden beet, as a garden vegetable; the sugar beet, a major source of sugar and commercially the most important type; the mangel-wurzel, a succulent feed for livestock; and the leaf beet, or Swiss chard, for its edible leaves. Beet greens are a source of riboflavin, iron, and vitamins A and C. Beets are grown most extensively in temperate to cool regions or during the cooler seasons.

Beethoven Vba-.to-vsnV Ludwig van (baptized Dec. 17, 1770,

Bonn, archbishopric of Cologne — d.

March 26, 1827, Vienna, Austria)

German composer. Born to a musical family, he was a precociously gifted pianist and violist. After nine years as a court musician in Bonn, he moved to Vienna to study with Joseph Haydn and remained there for the rest of his life. He was soon well known as both a virtuoso and a composer, and he became the first important composer to earn a successful living while forsaking employment in the church or court. He uniquely

straddled the Classical and Romantic eras. Rooted in the traditions of Haydn and Mozart, his art also encompassed the new spirit of humanism expressed in the works of German Romantic writers as well as in the ide-

als of the French Revolution, with its passionate concern for the freedom and dignity of the individual. His astonishing Third (Eroica) Symphony (1803) was the thunderclap that announced the Romantic century, and it embodies the titanic but rigorously controlled energy that was the hallmark of his style. He began to lose his hearing from c. 1795; by c. 1819 he was totally deaf. For his last 15 years he was unrivaled as the world's most famous composer. In musical form he was a considerable innovator, widening the scope of sonata, symphony, concerto, and string quartet. His greatest achievement was to raise instrumental music, hitherto considered inferior to vocal, to the highest plane of art. His works include the celebrated 9 symphonies; 16 string quartets; 32 piano sonatas; the opera Fidelio (1805, rev. 1 8 14);2 masses, including the Missa Solemnis (1823); 5 piano concertos; a violin concerto (1806); 6 piano trios; 10 violin sonatas; 5 cello sonatas; and several concert overtures.

beetle Any of at least 250,000 species of insects constituting the order Coleoptera (the largest order in the animal kingdom), characterized by special forewings, called elytra, which are modified into hardened covers over a second pair of functional wings. Beetles occur in almost all environments except Antarctica and the peaks of the highest mountains. Temperate zones have fewer beetle species than the tropics but in greater numbers. The smallest species are less than 0.04 in. (1 mm) long; the largest can exceed 8 in. (20 cm). Most beetles eat either other animals or plants; some eat decaying matter. Some species destroy crops, timber, and textiles and spread parasitic worms and diseases. Others are valuable predators of insect pests. Some beetles are known by other common names (e.g., borer, chafer, curculio, firefly, weevil). Beetles are preyed on by other insects and by bats, swifts, and frogs.

Begin \be-'gen,\ English \'ba-gin\, Menachem (Wolfovitch) (b.

Aug. 16, 1913, Brest-Litovsk,

Russia — d. March 9, 1992, Tel Aviv,

Israel) Prime minister of Israel (1977-83). He earned a law degree from the University of Warsaw, Pol.

During World War II (1939 — 45) the Soviet authorities sent him to Siberia, but he was soon released to join the Polish army in exile. He escaped to Palestine, where he became leader in 1943 of the Irgun Zvai Leumi (a right-wing underground movement in favour of a Jewish state). From 1948 to 1977 he led the opposition in the Israeli Knesset, except for three years when he sat in the Government of National Unity (1967-70). As head of the Likud party coalition, he became prime minister

in 1977. He shared the 1978 Nobel Prize for Peace with Anwar el- Sadat for negotiations that resulted in the 1979 Israel-Egypt peace treaty. His 1982 invasion of Lebanon turned world opinion against Israel, and he resigned in 1983. See also Arab-Israeli wars; Vladimir Jabotinsky.

begonia \bi-'gon-y3\ Any of about 1,000 species (genus Begonia) of mostly succulent, tropical or subtropical plants, many with colourful flowers or leaves and used as potted plants indoors or as garden plants. Begonias come in a bewildering array of cultivated varieties. The wax begonia (B . semperfiorens) is the most popular for use as a summer bedding plant; angelwing begonias are characterized by their tall stems; hairy begonias have feltlike leaves. Most begonias are tender and intolerant of dry conditions; they require protection from strong sunlight.

Behan \'be-9n\, Brendan (Francis) (b. Feb. 9, 1923, Dublin, Ire. — d. March 20, 1964, Dublin) Irish author. An alcoholic from age eight and an anti-English rebel, he was repeatedly arrested. Borstal Boy (1958) is an account of his detention in an English reform school, which combines earthy satire and powerful political commentary. His first play. The Quare Fellow { 1954), is an explosive statement on capital punishment and prison life. His second, The Hostage (produced 1958), is considered his masterwork. He also wrote poetry, short stories, radio scripts, anecdotes, memoirs, and a novel.

behaviour genetics Study of the influence of an organism’s genetic composition on its behaviour and of the interaction of heredity and envi-

Beet (Beta).

GRANT HEILMAN

Menachem Begin, 1987.

RALPH CRANE/CAMERA PRESS FROM GLOBE PHOTOS

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ronment (“nature” and “nurture”) in determining behaviour. The first scientist to explore the area was Sir Francis Galton, who sought to show that mental powers run in families. His work was followed by huge numbers of studies seeking to establish a link between IQ and genetics, none of them conclusive. Other human characteristics or behaviours studied for their possible hereditary nature include schizophrenia, alcoholism, depres-

sion, introvert and extravert behaviour, and general activity level (including sleep disorders). Many such studies are based on long-term observation of identical (monozygotic) twins raised in different environments. In animal studies, which examine topics such as learning, sexual activity, and aggressive behaviour, selective breeding is used to produce groups of genetically similar individuals that may be compared with other, dissimilar individuals or groups. See also human nature.

behaviour therapy or behaviour modification Application of experimentally derived principles of learning to the treatment of psychological disorders and the control of behaviour. The concept, which has its roots in the work of Edward L. Thorndike, was popularized in the U.S. by theorists of behaviourism, including B.F. Skinner. Behaviour-therapy techniques are based on the principle of operant conditioning, in which desired behaviours are rewarded. There is little or no concern for conscious experience or unconscious processes. Such techniques have been applied with some success to disturbances such as enuresis, tics, phobias, stuttering, obsessive-compulsive disorder, and various neuroses. Behaviour modification more generally refers to the application of reinforcement techniques for shaping individual behaviour toward some desired end or for controlling behaviour in classrooms or institutional situations. See also psychotherapy.

behaviourism Highly influential academic school of psychology that dominated psychological theory in the U.S. between World War I and World War 11. Classical behaviourism concerned itself exclusively with the objective evidence of behaviour (measured responses to stimuli) and excluded ideas, emotions, and inner mental experience (see conditioning). It emerged in the 1920s from the work of John B. Watson (who borrowed from Ivan Pavlov) and was developed in subsequent decades by Clark L. Hull and B.F. Skinner. Through the work of Edward C. Tolman, strict behaviourist doctrines began to be supplemented or replaced by those admitting such variables as reported mental states and differences in perception. A natural outgrowth of behaviourist theory was behaviour therapy.

Behn Vban\, Aphra (b. July 1640, Harbledown?, Kent, Eng. — d. April 16, 1689, London) English dramatist, novelist, and poet, the first Englishwoman known to earn her living by writing. Her early life is obscure (as is her original surname), but she spent most of it in South America. She married a merchant named Behn in 1658; he died in the mid 1660s. Her novel Oroonoko (1688), the story of an enslaved African prince whom Behn knew in South America, influenced the development of the English novel. Her first play. The Forc’d Marriage, was produced in 1671; her later witty comedies, such as the two-part The Rover (1677, 1681), were highly successful, and toward the end of her life she wrote many popular novels.

Behrens \'ba-rens\, Peter (b. April 14, 1868, Hamburg — d. Feb. 27, 1940, Berlin, Ger.) German architect and designer. He became director of Diisseldorf’s arts and crafts school in 1903. The large electrical company AEG hired him in 1907 as its artistic adviser, a comprehensive job that led him to design the hexagonal trademark of the AEG, its catalogs, its office stationery, products such as electric fans and street lamps, and retail shops and factories. His AEG Works turbine factory in Berlin

(1909-12), with its sweeping glass curtain wall, became the most significant building in Germany at that time. He was an influential pioneer of Modernism; Walter Gropius, Le Corbusier, and Ludwig Mies van der Rohe all worked in his office.

Behrman Vber-monV, S(amuel)

N(athaniel) (b. June 9, 1893,

Worcester, Mass., U.S. — d. Sept. 9, 1973, New York, N.Y.) U.S. playwright. He contributed to New York newspapers and magazines and studied drama at Harvard University. His successful first play, the light comedy The Second Man (1927), was followed by the popular Meteor (1929), Brief Moment (1931), and Biography (1932). His more serious plays include Rain from Heaven (1934) and No Time for Comedy (1939). Noted for addressing complex social and moral issues, he wrote over 25 comedies in his 40-year career, and nearly every one was a hit.

Beiderbecke Vbl-dor-.bekV (Leon) Bix (b. March 10, 1903, Davenport, Iowa, U.S. — d. Aug. 6, 1931,

Long Island, N.Y.) U.S. jazz cometist and composer. Beiderbecke developed a style independent of the influence of Louis Armstrong and became the leading player of the Chicago style of jazz in the 1920s.

He was noted for his gentle, clear tone and introspective approach. His interest in the harmonies of composers such as Claude Debussy was reflected in both his playing and his compositions. With saxophonist Frankie Trumbauer, Beiderbecke worked in the bands of Jean Goldkette and Paul Whiteman. His alcoholism and early death contributed to his status as one of the early romantic legends of jazz.

Beijing \'ba-'jiq\ or Pei-ching

conventional Peking Vpe-'kiqV/ormerly (1928-49) Beiping Vba-'pigV City, municipality with provincial status (pop., 2003 est.: city, 7,699,300; 2002 est.: municipality, 14,230,000), and capital of China. The municipality is bordered by Hebei province and Tianjin municipality and has an area of 6,500 sq mi (16,800 sq km). Lying on a broad plain in northeastern China, the city has been settled since ancient times and has been known by various names. It became the royal residence of Kublai Khan, who in 1272 named it Dadu. It was chosen as the capital of the Ming dynasty (1368-1644) in 1421, which it remained during the Qing dynasty

(1644–191 1/12). It suffered heavy damage when it was occupied by European forces in 1860 and 1900 (see Boxer Rebellion). In 1928 the capital was moved to Nanjing, and the name Beiping (Pei-p’ing) was given to the former capital. Nearby, in 1937, the Marco Polo Bridge Incident took place. Beijing’s capital status and its former name were restored following the communist victory in 1949. It is China’s cultural and educational centre. The old Forbidden City contains the former imperial palace, designated a UNESCO World Heritage site in 1987. Abutting it is Tiananmen Square, one of the world’s largest public squares. Beijing’s 15th-century walls were partly demolished in the Cultural Revolution. In 2001 the city was selected as the site for the 2008 Summer Olympic Games.

Beijing University See Peking University

Beilstein \'bil- 1 shtin\ / Friedrich Konrad (b. Feb. 17, 1838, St. Petersburg, Russia — d. Oct. 18, 1906, St. Petersburg) Russian chemist. From 1866 to his retirement he taught at St. Petersburg’s Technical Institute. His Handbuch der organischen Chemie (“Handbook of Organic Chemistry”; 1st ed., 1880-83) fully described 15,000 organic compounds. The fourth edition (27 vol., 1937) is periodically supplemented, and remains indispensable for workers in organic chemistry.

Beira \'ba-ro\ Coastal city (pop., 1997: 412,588), central Mozambique. Situated on the Mozambique Channel at the mouths of the Pungoe and Buzi rivers, it is the chief port for central Mozambique and for landlocked Zimbabwe and Malawi. Founded in 1891 as a trading company’s headquarters, it passed to Portuguese administration in 1942 and then to independent Mozambique in 1975. It is the terminus of railways from South Africa, Zimbabwe, Congo (Kinshasa), Zambia, and Malawi.

Beirut \ba-'rut\ City (pop., 1998 est.: metro, area, 1,500,000), capital of Lebanon. The country’s chief port and largest city, it lies at the foot of the Lebanon Mountains. Initially settled by the Phoenicians, it gained prominence under Roman rule in the 1st century bc. It was captured by the Arabs in ad 635. Christian Crusaders held Beirut (1110-1291), after which it was dominated by the Mamluk dynasty. In 1517 it fell under the control of the Ottoman Empire. Under a French mandate, it became the capital of the new state of Lebanon in 1920 and capital of an independent Lebanon

Behrens, painting by Max Liebermann.

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in 1943. It went on to flourish as the chief banking hub and a major cultural centre of the Middle East. It was severely damaged during the Leba-

nese Civil War (1975-91) and during fighting between Israeli forces and those of the Palestine Liberation Organization in 1982. The city slowly began to rebuild after the end of the civil war.

Bejart \ba-'zhar\, Maurice orig. Maurice Jean Berger (b. Jan. 1, 1927, Marseille, Fr.) French-bom Belgian dancer, choreographer, and opera director. He studied in Paris, then toured with various companies before founding his own, Les Ballets de l'Etoile (later Ballet Theatre de Maurice Bejart), in Paris in 1954. In 1959 it moved to Brussels; renamed the Ballet of the 20th Century, it became one of the world's foremost troupes. His productions have been noted for reworking tradition in unusual and often controversial ways. Since 1961 he has also worked in opera, staging Tales of Hoffmann and Berlioz's Damnation of Faust , among other works. In 1987 the company moved to Switzerland and took the new name Bejart Ballet Lausanne.

Bejart \ba-'zhar\ family Seventeenth-century French theatrical family. Brothers Joseph (c. 1617-59) and Louis (1630-78) and their sisters Madeleine (1618-72) and Genevieve (c. 1622-75) were members of a traveling company directed by Madeleine. They joined Moliere's first company, the Illustre Theatre, in 1643 and created many parts in his plays. Madeleine's sister, or possibly daughter, Armande Bejart (1642-1700), joined the company in 1653. She married Moliere in 1662 and played most of his heroines. After his death, she led the company until it merged with another troupe to become the Comedie-Francaise in 1680.

Bekesy Vba-,ka-she\, Georg von (b. June 3, 1899, Budapest, Hung. — d. June 13, 1972, Honolulu, Hawaii, U.S.) Hungarian-born U.S. physicist and physiologist. He immigrated to the U.S. in 1947 and taught at Harvard University in 1947-66. He discovered that sound vibrations travel along a membrane in the cochlea in waves, peaking at different places, where nerve receptors determine pitch and loudness. His research resulted in greatly expanded understanding of the hearing process, partly through instrumentation Bekesy had helped design, and the differentiation of forms of deafness, which permitted the selection of proper treatment. He received a 1961 Nobel Prize for Physiology or Medicine.

Bekhterev Vbyak-tir-yif\, Vladimir (Mikhaylovich) (b. Feb. 1, 1857, Sorali, Vyatka, Russia — d. Dec. 24, 1927, Moscow, Russia, U.S.S.R.) Russian neurophysiologist and psychiatrist. A competitor of Ivan Pavlov, Bekhterev independently developed a theory of conditioned reflexes. His most lasting work was in brain structure research and descriptions of nervous symptoms and illnesses. He discovered the superior vestibular nucleus (Bekhterev nucleus) and other brain formations and described spinal numbness (spondylitis deformans, or Bekhterev disease) and other diseases. He founded the first Russian journal on nervous diseases. His approach to the study of behaviour influenced the growing movement toward behaviourism in the U.S.

Bel Akkadian god of the atmosphere and member of a triad including Anu (An) and Ea (Enki). His Sumerian counterpart was Enlil. His breath brought both severe storms and gentle spring winds. He was the god of agriculture and as such was more important than the high god Anu. As Bel he was known as the god of order and destiny. As Enlil, he was banished to the underworld for raping his consort Ninlil (Belit), in a myth that explains the cycle of the seasons.

Bel See Marduk

Belafonte V.bel-o-'fan-taV Harry orig. Harold George Belafonte, Jr, (b. March 1, 1927, New York, N.Y., U.S.) U.S. singer, actor, and producer. He was born to immigrants from Martinique and Jamaica, and he lived with his mother in Jamaica from 1935 to 1940. In the early 1950s he initiated a fad for calypso music with songs such as “Day-O (Banana Boat Song)” and “Jamaica Farewell.” He starred in the films Carmen Jones (1954) and Island in the Sun (1957) and later became the first black television producer. In the 1960s and ’70s he was a prominent civil-rights activist. From the 1970s onward his singing career was a secondary occupation, and he acted in films such as Uptown Saturday Night (1974) and Kansas City (1996).

Belarus Country, eastern Europe. Area: 80,200 sq mi (207,600 sq km). Population (2005 est.): 9,776,000. Capital: Minsk. The population is mainly Belarusian, with Russian and Ukrainian minorities. Languages: Belarusian, Russian (both official). Religion: Christianity (predominantly Eastern Orthodox; also Roman Catholic). Currency: rubel. The northern part of the country is crossed by the Western Dvina (Dzvina) River; the Dnieper (Dnyapro) flows through eastern Belarus; the south has extensive marshy areas along the Pripet (Prypyats’) River; the upper course of the Neman (Nyoman) flows in the west; and the Bug (Buh) forms part of the boundary with Poland in the southwest. The chief cities, in addition to Minsk, are Homyel, Mahilyow, and Vitsyebsk. Agriculture, once the linchpin of the Belarusian economy, has diminished in importance, while manufacturing and the service sector have grown. Belarus is a republic with two legislative houses; its president is head of state and government. Although Belarusians share a distinct identity and language, they never previously enjoyed political sovereignty. The territory that is now Belarus underwent partition and changed hands often; as a result, its history is entwined with its neighbours’. In medieval times the region was ruled by Lithuanians and Poles. Following the Third Partition of Poland, Belarus was ruled by Russia. After World War I the western part was assigned to Poland, and the eastern part became Soviet territory. After World War II the Soviets expanded what had been the Belorussian S.S.R. by annexing more of Poland. Much of the area suffered radioactive contamination from the Chernobyl accident in 1986, which forced many to evacuate. Belarus declared its independence in 1991 and later joined the Commonwealth of Independent States. Amid increasing political turmoil in the 1990s, it moved toward closer union with Russia but continued to struggle economically and politically at the start of the 21st century.

Belarusian X.bya-lo-'rU-se-onV language or Belarusan

\ l bya-b- , riis-3n\ language East Slavic language of Belarus, spoken by some 10.2 million people worldwide. Belarusian features begin to appear in Church Slavonic manuscripts from the 14th century (see Old Church Slavonic language). The chancery language of the grand duchy of Lithuania, used in the 15th– 16th centuries, contains a substantial Belarusian element, mixed with Church Slavonic, Ukrainian, and Polish. Belarusian was not fully elaborated as a modern literary language until the early 20th century, when orthographic norms for writing it in Cyrillic were estab-

lished. It has long struggled to maintain itself against Russian, particularly in Belarusian urban centres, where there is a high degree of Russification and Belarusian-Russian bilingualism.

Belasco \b9-'las-ko\, David (b. July 25, 1853, San Francisco, Calif., U.S. — d. May 14, 1931, New York, N.Y.) U.S. theatrical producer and playwright. He acted with traveling companies before becoming a theatre manager, first in San Francisco and later in New York City (from 1880). An independent producer from 1890, he built his own theatre in 1906; there he introduced changes in stage lighting, used realistic scenery, and demanded high production standards. He successfully fought against the

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monopolistic Theatrical Syndicate. He wrote or collaborated on numerous plays, including Madame Butterfly (1900) and The Girl of the Golden West (1905), which were made into operas by the Italian composer Giacomo Puccini.

Belau See Palau

Belem \be-'lem\ City (pop., 2000 prelim.: metro, area , 1,271,615), northern Brazil. The capital of Para state, the port of Belem lies on the Para River in the vast Amazon River delta 90 mi (145 km) from the Atlantic Ocean. It began in 1616 as a fortified settlement; as it gradually became established, it helped consolidate Portuguese supremacy in northern Brazil. It was made the state capital in 1772. It enjoyed prosperity in the late 19th century as the main exporting centre of the Amazon rubber industry. After the rubber era ended in 1912, it continued to be northern Brazil’s commercial centre and a main port for Amazon River craft.

belemnoid Vbel-om-.noidX or belemnite Member of an extinct group of cephalopods, possessing a large internal shell, that first appeared c. 345 million years ago, in the Early Carboniferous Period, and became extinct during the Eocene Epoch, which ended c. 36.6 million years ago. The internal shell of most species is straight, but that of some species is loosely coiled. The shell served for support and muscle attachment and enabled the animal to compensate for depth and its own body weight. See also ammonoid.

Belfast District, seaport, and capi-

tal (pop., 1999 est.: 297,200) of Northern Ireland. On the River Lagan, the site was occupied in the Stone and Bronze ages, and the remains of Iron Age forts can still be seen. Belfast's modern history began in the early 17th century when Sir Arthur Chichester developed a plan for colonizing the area with English and Scottish settlers. Having survived the Irish insurrection of 1641, the town grew in economic importance, especially after a large immigration of French Huguenots arrived after the rescinding of the Edict of Nantes (1685) and strengthened the linen trade. It became a centre of Irish Protestantism, setting the stage for sectarian conflict in the 19th-20th centuries. Fighting was renewed in the 1960s and did not subside until a peace agreement was reached in 1998. The city is Northern Ireland's educational and commercial hub.

belfry Bell tower, either freestanding or attached to another structure. More particularly it refers to the room, usually at the top of such a tower, where the bells and their supporting timberwork are hung. The belfry is a prominent feature of Belgian Gothic architecture, especially in Flanders. The Halles (Market Hall) and belfry in Brugge (late 13th century) is a typical example. The term derives from the medieval siege tower (ber - frei), a tall wooden structure that could be rolled up to a fortification wall so that the warriors hidden inside could storm the battlements.

Belgae \'bel-,gi\ Inhabitants of Gaul north of the Sequana (Seine) and Matrona (Marne) rivers. The term was apparently first applied by Julius Caesar, whose Gallic victories (54-5 1 bc) sent many Belgae into Britain, where they formed kingdoms, the most important of which were at Camulodunum (Colchester), Verulamium (St. Albans), and Calleva Atrebatum (Silchester).

Belgian Congo See Democratic Republic of the Congo

Belgica Vbel-ji-koX Ancient country, northeastern Gallia (Gaul). One of the administrative areas into which Augustus divided Gaul, it stretched from the Seine River to the Rhine and included the Low Countries. Its capital was Durocortorum Remorum (now Reims). Part of the area became Germania Inferior and Germania Superior under Domitian, and later, under Diocletian, the remainder was divided into Belgica Prima and Belgica Secunda. In the 5th century ad, Belgica was absorbed by the Franks. See also Belgium.

Belgium officially Kingdom of Belgium Country, northwestern Europe. Area: 11,787 sq mi (30,528 sq km). Population (2005 est.): 10,432,000. Capital: Brussels. The population consists mostly of Flemings and Walloons. The Flemings, more than half of the population, speak

Reconstruction of squidlike belemnoid cephalopods from the Cretaceous System, southern Tennessee

COURTESY OF THE AMERICAN MUSEUM OF NATURAL HISTORY, NEW VORK

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LUXEMBOURG

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NORTH SEA

Brugge-Zeebrugge
Canal.

Blankenberge^
0stend^~^T , ^
Nieuwpoort^

BELGIUM

Flemish (Dutch) and live in the northern half of the country; the Walloons, about one-third of the population, speak French and inhabit the southern half. Languages: Dutch, French, German (all official). Religions: Christianity (predominantly Roman Catholic); also Islam. Currency: euro. Belgium can be divided into several geographic regions. The southeast consists of the forested Ardennes highland, which extends south of the Meuse River valley and includes Belgium’s highest point, Mount Botrange (2,277 ft [694 m]). Middle Belgium is a fertile region crossed by tributaries of the Schelde River. Lower Belgium comprises the flat plains of Flanders in the northwest with their many canals. Maritime Flanders borders the North Sea and is agriculturally prosperous; the chief North Sea port is Ostende, but Antwerp, near the mouth of the Schelde, handles more trade. Belgium has minimal natural resources, so the manufacture of goods from imported raw materials plays a major role in the economy, and the country is highly industrialized. It is a monarchy with a parliament composed of two legislative houses; the chief of state is the monarch, and the head of government is the prime minister. Inhabited in ancient times by the Belgae, a Celtic people, the area was conquered by Julius Caesar in 57 bc; under Augustus it became the Roman province of Belgica. Conquered by the Franks, it later broke up into semi-independent territories, including Brabant and Luxembourg. By the late 15th century the territories of the Netherlands, of which the future Belgium was a part, gradually united and passed to the Habsburgs. In the 16th century it was a centre for European commerce. The basis of modern Belgium was laid in the southern Catholic provinces that split from the northern provinces after the Union of Utrecht in 1579 (see The Netherlands). Overrun by the French and incorporated into France in 1801, the area was reunited with Holland and with it became the independent Kingdom of The Netherlands in 1815. After the revolt of its citizens in 1830, it became the independent Kingdom of Belgium. Under Leopold II it acquired vast lands in Africa. Overrun by the Germans in World Wars I and II, it was the scene of the Battle of the Bulge (1944-45). Internal discord led to legislation in the 1970s and ’80s that created three nearly autonomous regions in accordance with language distribution: Flemish Flanders, French Wallonia, and bilingual Brussels. In 1993 Belgium became a federation comprising the three regions, which gained greater autonomy at the outset of the 21st

century. It is a member of the European Union.

Belgrade Serbian Beograd \ba-'6-,grad\ City (pop., 2002: 1,120,092), capital of the republic of Serbia and administrative centre of Serbia and Montenegro. Lying at the juncture of the Danube and Sava rivers, it is one of the Balkans' most important commercial and transportation centres. Inhabited by Celts in the 4th century bc, it was later taken by the Romans and named Singidunum. It was destroyed by Huns in the

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5th century. In the 11th century it became a frontier town of Byzantium and in the 13th century came under the rule of Serbia. The Ottoman Empire besieged the city in the 15th century, and the forces of SOleyman I finally took it in 1521; it was held almost continuously by the Turks into the 19th century. It became the capital of the kingdom of Serbia in 1867 and, after World War I, of the new Kingdom of Serbs, Croats, and Slovenes (renamed Yugoslavia in 1929). It suffered severely under Nazi occupation (1941 — 44). It was damaged by NATO bombers in the Kosovo conflict (1999). Yugoslavia underwent many border changes in the 20th century and was renamed Serbia and Montenegro in 2003.

Belgrade, Peace of (1739) Either of two peace settlements that ended the Ottoman empire's four-year war with Russia and its two-year war with Austria. In 1735 Russia had attempted to establish itself on the northern Black Sea. Austria entered the war as Russia's ally in 1737, but military failures prompted it to make a separate peace in September 1739, ceding northern Serbia (including Belgrade) and Little Walachia to the Ottomans. With Austria's defection, the Russians had to make a disappointing peace that same month. Under its terms, Russia could not have warships on the Black Sea and had to depend on Ottoman shipping for its Black Sea commerce.

Belhadj \bel-'haj\, Ali also spelled 'All Bel Hajj (b. c. 1956, Tunisia) Deputy leader of the Islamic Salvation Front (FIS), an Algerian political party. Bom to Algerian parents, he became a high-school teacher and an imam. He and the more moderate Abbasi al-Madani registered FIS as a political party in 1989. In 1990 FIS won a majority of votes in local elections; in 1991 the Algerian government announced martial law and imprisoned Belhadj and al-Madani. In 1994 Belhadj was transferred to house arrest.

Belidor \ba-le-'dor\, Bernard Forest de (b. 1698, Catalonia, Spain — d. Sept. 8, 1761, Paris, France) French military and civil engineer. After serving in the French army, he worked on measuring an arc of the Earth. As professor of artillery at a French military school, he wrote notable books on engineering, artillery, ballistics, and fortifications, but his fame rests primarily on his classic Architecture hydraulique (4 vol.,

1737-53), covering engineering mechanics, mills and waterwheels, pumps, harbours, and sea works.

Belinsky \byol-'yen-ske\, Vissarion (Grigoryevich) (b. May 30,

1811, Sveaborg, Fin., Russian Empire — d. May 26, 1848, St. Petersburg, Russia) Russian literary critic. Expelled from the University of Moscow in 1832, he worked as a journalist, making his reputation with critical articles that expounded nationalist doctrine. His argument that literature should express political and social ideas had a major impact on Soviet literary criticism, and he was often called the father of the Russian radical intelligentsia.

Belisarius (b. c. 505, Germania, Illyria? — d. March 565) Byzantine general. While serving in the bodyguard of Emperor Justinian I, he was appointed (c. 525) to command in the eastern armies, and he defeated the Persians in the Battle of Dara (530). In 532 Belisarius further gained Justinian's confidence by commanding the troops that ended the Nika Insurrection that nearly toppled the emperor. He led expeditions to overthrow the Vandals in North Africa (533) and regain Sicily and southern Italy from the Ostrogoths (535-537), defending Rome (537-538). He was offered a kingship by the Goths, which caused Justinian to recall him in disfavour. He was sent again to Rome (544-548) but with inadequate forces, and he was replaced by Narses in 548. Still loyal to Justinian, he was recalled in 559 to repel Hun invaders.

Belit \'ba-lit\ Akkadian goddess of destiny, consort of Bel, and mother of the moon god. Sin. Her Sumerian counterpart was Ninlil. Assyrians sometimes identified her with Ishtar. Ninlil was a grain goddess, and the story of her rape by Enlil, the Lord of the Wind, reflects the seasonal cycle of pollination, ripening, and withering.

Belitung See Billiton

Beliveau \'bel-i-vo\, Jean (Marc A.) (b. Aug. 31, 1931, Trois-Rivieres, Que., Can.) Canadian ice-hockey centre. He played for the Montreal Canadiens from 1953 to 1971. His career record of 79 goals and 176 points made during play-off games, including 17 Stanley Cup championships, stood until 1987.

Belize \bo-Tez \ formerly (1840-1973) British Honduras Country, Central America. Area: 8,867 sq mi (22,965 sq km). Population (2005

GUATEMALA

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HALF MOON CAY
NATIONAL MONUMENT

est.): 291,000. Capital: Belmopan. Most Belizeans are of mixed ancestry (Indian-European, African-European), with smaller groups of Maya Indians and Garifuna. Languages: English (official), Creole, Spanish. Religion: Christianity (Roman Catholic, Protestant). Currency: Belize dollar. The country is bounded to the north by Mexico, to the east by the Caribbean Sea, and to the west and south by Guatemala. Belize is a land of mountains, swamps, and tropical jungles. The northern half consists of swampy lowlands drained by the Belize and Hondo rivers; the latter forms the boundary with Mexico. The southern half is more mountainous and contains the country’s highest point, Victoria Peak (3,681 ft [1,122 m]). Off the coast lies Belize Barrier Reef, the world’s second largest barrier reef. Belize is relatively prosperous and has a developing free-market economy with some government participation. It is a constitutional monarchy with two legislative houses; its head of state is the British monarch represented by a governor-general, and the head of government is the prime minister. The area was inhabited by the Maya (c. 300 bc-ad 900); the ruins of their ceremonial centres, including Caracol and Xunantunich, can still be seen. The Spanish claimed sovereignty from the 16th century but never tried to settle Belize, though they regarded the British who did as interlopers. British loggers arrived in the mid- 17th century; Spanish opposition was finally overcome in 1798. When settlers began to penetrate the interior, they met with Indian resistance. In 1871 British Honduras became a crown colony, but an unfulfilled provision of an 1859 British-Guatemalan treaty led Guatemala to claim the territory. The situation had not been resolved when Belize was granted its independence in 1981. Although Guatemala officially recognized the territory’s independence in 1991, a British force, stationed there to ensure the new country’s security, was not withdrawn until 1994.

Belize City City (pop., 2000: 49,050), Belize. The chief seaport and former capital of Belize, it lies at the mouth of the Belize River, which

was until the 10th century a heavily populated trade artery of the Maya empire. The British settled the area in the 17th century. The city, built on ground only slightly above sea level, has been ravaged by hurricanes, so the capital was moved inland to Belmopan in 1970.

bell Hollow vessel, usually of metal, that produces a ringing sound when struck by an interior clapper or a mallet. In the West, open bells have acquired a standard “tulip” shape. Though the vibrational patterns of such open bells are basically nonharmonic, they can be tuned so that the lower overtones produce a recognizable chord. Forged bells have existed for many thousands of years. Bells were first cast, or founded, in the Bronze Age; the Chinese were the first master founders. Bells have carried a wide range of cultural meanings. They are particularly important in religious

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ritual in East and South Asia. In Christianity, especially Russian Orthodoxy, bells have also been used ritually. They have tolled the hours from monastery and church steeples, originally to govern monastic routine and later also to fill a similar role for the secular world.

Bell, Alexander Graham (b. March 3, 1847, Edinburgh, Scot. — d. Aug. 2, 1922, Beinn Bhreagh, Nova Scotia, Can.) Scottish-born U.S. audiologist and inventor. He moved to the U.S. in 1871 to teach the visible-speech system developed by his father, Alexander Melville Bell (1819-1905). He opened his own school in Boston for training teachers of the deaf (1872) and was influential in disseminating these methods. In 1876 he became the first person to transmit intelligible words through electric wire (“Watson, come here, I want you,” spoken to his assistant Thomas Watson). He patented the telephone the same year, and in 1877 he cofounded Bell Telephone Co. With the proceeds from France’s Volta Prize, he founded Volta Laboratory in Washington,

D.C., in 1880. His experiments there led to the invention of the photophone (which transmitted speech by light rays), the audiometer (which measured acuteness of hearing), the Graphophone (an early practical sound recorder), and working wax

recording media, both flat and cylindrical, for the Graphophone. He was chiefly responsible for founding the journal Science, founded the American Association to Promote Teaching of Speech to the Deaf (1890), and continued his significant research on deafness throughout his life.

Bell, (Arthur) Clive (Heward) (b. Sept. 16, 1881, East Shefford, Berkshire, Eng. — d. Sept. 17, 1964, London) British art critic. He studied at Cambridge University and in Paris. In 1907 he married Vanessa Stephen, sister of Virginia Woolf; with Virginia's husband, Leonard Woolf, and Roger Fry, they formed the core of the Bloomsbury group. Bell's most important aesthetic ideas were published in Art (1914) and Since Cezanne (1922), in which he promoted his theory of "significant form" (the quality that distinguishes works of art from all other objects). His assertion that art appreciation involves an emotional response to purely formal qualities, independent of subject matter, was influential for several decades.

Bell, Cool Papa orig. James Thomas Bell (b. May 17, 1903, Starkville, Miss., U.S. — d. March 7, 1991, St. Louis, Mo.) U.S. baseball player. Bell was a switch-hitting outfielder for most of his career. Playing primarily in the Negro leagues, he is said to have stolen 175 bases in a 200-game season and is reputed to have been the fastest base runner of all time. Also a fine hitter, he once batted .391 over a five-year period. He was inducted into the Baseball Hall of Fame in 1972.

Bell, Gertrude (b. July 14, 1868, Washington Hall, Durham, Eng. — d. July 12, 1926, Baghdad, Iraq) British traveler, writer, and colonial administrator. After graduating from Oxford, she journeyed throughout the Middle East. After World War I she wrote a well-received report on the administration of Mesopotamia between the end of the war (1918) and the Iraqi rebellion of 1920 and later helped determine postwar boundaries. In 1921 she helped place a son of the sharif of Mecca, Faysal I, on the Iraqi throne. In helping create the National Museum of Iraq, she promoted the idea that excavated antiquities should stay in their country of origin.

Bell, John (b. Feb. 15, 1797, near Nashville, Tenn., U.S. — d. Sept. 10, 1869, Dover, Tenn.) U.S. politician. He represented Tennessee in the U.S. House of Representatives (1827-41) and Senate (1847-59). Although a large slaveholder, he opposed efforts to expand slavery to U.S. territories and voted against admitting Kansas as a slave state. His defense of the Union brought him the 1860 nomination for president on the Constitutional Union ticket, but he carried only three states. He later supported the South in the American Civil War.

Bell Burnell, (Susan) Jocelyn orig. Susan Jocelyn Bell (b. July 15, 1943, Belfast, N.Ire.) British astronomer. As a research assistant at the

University of Cambridge, she assisted in constructing a large radio telescope and discovered pulsars, cosmic sources of peculiar radio pulses, providing the first direct evidence for the existence of rapidly spinning neutron stars. The 1974 Nobel Prize for Physics was awarded for the discovery of pulsars to Antony Hewish (her adviser) and Martin Ryle, sparking a controversy over the omission of Bell Burnell. She subsequently became a professor at Open University and vice president of the Royal Astronomical Society.

bell curve See normal distribution

Bell Laboratories U.S. research and development company (founded 1925) that develops telecommunications equipment and carries out defense-related research. Formerly part of AT&T, it now belongs to Lucent Technologies, Inc., which spun off from AT&T in 1996. Bell Labs has produced thousands of inventions, including the first synchronous-sound motion-picture system, the electrical-relay digital computer, the laser, the solar cell, UNIX, and the C and C++ programming languages. Several Bell researchers have won Nobel Prizes: Clinton Davisson, for demonstrating the wave nature of matter; John Bardeen, Walter H. Brattain, and William B. Shockley, for inventing the transistor; and Arno Penzias and Robert W. Wilson, for discovering cosmic microwave background radiation. It operates today in some 20 countries.

Bell palsy See paralysis

bell ringing See change ringing

Bella, Ahmed Ben See Ahmed Ben Bella

belladonna Tall, bushy, herbaceous plant, the deadly nightshade {Atropa belladonna), of the nightshade family; also, the crude drug consisting of its dried leaves or roots. The plant is a native of wooded or waste areas in central and southern Eurasia. It has dull green leaves, violet or greenish flowers, shiny black berries about the size of cherries, and a large, tapering root. Belladonna is highly poisonous and is cultivated for medicinal substances (alkaloids) that are derived from the crude drug and used in sedatives, stimulants, and antispasmodics. Because of toxicity and undesirable side effects, however, these substances are being replaced by synthetic drugs.

Bellamy Vbel-o-meX, Edward (b. March 26, 1850, Chicopee Falls, Mass., U.S.— d. May 22, 1898, Chicopee Falls) U.S. writer. Bellamy first became aware of the plight of the urban poor at age 1 8 while studying in Germany. He engaged throughout his life in progressive causes and wrote several books reflecting his concerns, but he is known chiefly for his utopian novel Looking Backward (1888), which describes the U.S. in the year 2000 as an ideal socialist state featuring cooperation, brotherhood, and industry geared to human need. It sold more than a million copies; a sequel.

Equality (1897), was less successful.

Bellarmine Vbel-.ar-monV, Saint Robert Italian Roberto Francesco Romolo Bellarmino (b.

Oct. 4, 1542, Monrepulciano,

Tuscany — d. Sept. 17, 1621, Rome; canonized 1930; feast day September 17) Italian cardinal and theologian.

He joined the Jesuits in 1560, and after ordination in the Spanish Netherlands (1570) he began to teach theology. He was made a cardinal in 1599 and an archbishop in 1602. He took a prominent part in the first examination of Galileo's writings; though somewhat sympathetic to Galileo, he thought it best to have the Copernican system declared "false and erroneous," which was done in 1616. He gave impartial attention to Protestant works and was regarded as an enlightened theologian. He died a pauper, having given all his funds to the poor. In 1931 he was named a Doctor of the Church.

Belle Isle, Strait of Channel, eastern Canada. The northern entrance from the Atlantic Ocean to the Gulf of St. Lawrence, it is 90 mi (145 km) long and 10-20 mi (16-32 km) wide. It flows between the northern tip

Alexander Graham Bell.

CULVER PICTURES

March 26, 1850, Chicopee Falls,

Bellamy

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of Newfoundland and southeastern Labrador and is the most direct route from the Saint Lawrence Seaway and Great Lakes ports to Europe. The cold Labrador Current flows through the strait, extending the period of ice cover and limiting shipping to between June and late November.

Bellerophon \b3-'ler-3-f3n\ Legendary Greek hero. The son of Glaucus and grandson of Sisyphus, as a youth in Corinth he tamed and rode the winged horse Pegasus. The wife of King Proteus of Argos fell in love with him, and when he rejected her, she falsely accused him of attempted rape. Proteus sent him to the king of Lycia with a message asking that he be killed. The king instead ordered him to kill the monster Chimera, and with the aid of Pegasus he succeeded. He married the king's daughter but later lost the favour of the gods and became an unhappy wanderer. Another version of the legend holds that he tried to fly up to heaven and was thrown from Pegasus and lamed.

bellflower Any of about 300 annual, perennial, and biennial herba-

ceous plants of the genus Campanula (family Campanulaceae) that bear bell-shaped, usually blue flowers. They are native mainly to northern temperate regions in both hemispheres, Mediterranean areas, and tropical mountains. Distribution and habitat may be quite diverse.

Species native to northern Eurasia and eastern North America but also grown in gardens are the bluebell (C. rotundifolia) and the tall bellflower (C. americana). The creeping bellflower (C. rapunculoides) is a notorious garden weed. Among the few food plants in the bellflower family, which includes a total of 40 genera and 700 species, are the rampion (C. rapunculus), eaten as a vegetable in parts of Europe, and some robust members — especially Canarina, Clermontia , and Centropogon — that produce edible berries.

Bellini, Vincenzo (b. Nov. 3, 1801, Catania, Sicily — d. Sept. 23, 1835, Puteaux, France) Italian composer. Born into a musical family, he was educated at the Naples Conservatory. He wrote his first opera at age 24 and went on to complete nine more before his death at age 33. The most famous are The Pirate (1827), The Capulets and the Montagues (1830), The Sleepwalker (1831), Norma (1831), and The Puritans (1835). His works, which rely strongly on beautiful vocal melody (bel canto), rivaled those of his contemporaries Gioacchino Rossini and Gaetano Donizetti in popularity.

Bellini \bal-'le-ne\ family Family of Italian artists. Jacopo Bellini (c. 1400-70/71) was trained under Gentile da Fabriano, and by c. 1440 he had a thriving studio in Venice. More important than his paintings are his two surviving sketchbooks, which contain nearly 300 drawings. He was the father-in-law of Andrea Mantegna. His son Gentile Bellini (c. 1429-1507) inherited his father’s sketchbooks and took over as head of the studio. His most important extant works are two huge canvases. Procession of the Relic of the True Cross (1496) and Miracle at the Bridge of San Lorenzo (1500), depicting scenes of contemporary Venetian life. Gentile’s brother Giovanni Bellini (called Giambellino, c. 1430-1516) was the greatest and most prolific artist of the family. He transformed Venice into a Renaissance centre rivaling Florence and Rome. Giovanni was an early master of oil painting. Primarily a religious painter, he also excelled at portraits, of which Doge Leonardo Loredan (c. 1501) is his best known. Titian and Giorgione were probably trained in his workshop. See also Venetian school.

Belloc \'bel-,ak\, (Joseph-Pierre) Hilaire (b. July 27, 1870, La Celle-Saint-Cloud, France — d. July 16, 1953, Guildford, Surrey, Eng.) French-born British poet, historian, Catholic apologist, and essayist. A highly versatile writer, he is best remembered for his light verse, particularly for children, and for his lucid and graceful essays. His works include Verses and Sonnets (1895), The Bad Child’s Book of Beasts (1896), The Modern Traveller (1898), Mr. Burden (1904), and Cautionary Tales (1907). He also wrote several historical works, including a four- volume History of England (1925-31).

Bellotto \bel-'lot-to\, Bernardo known as Canaletto (b. Jan. 30, 1720, Venice — d. Oct. 17, 1780, Warsaw, Pol.) Italian painter of topographical views, known as vedute ("view paintings"). He was the nephew

of Canaletto and was himself known by that name when painting outside Italy. In 1747 he left Italy to spend the rest of his life working at various European courts, most notably at Dresden for Frederick Augustus II (1747-66) and at Warsaw for Stanislav/ II (1767-80). His detailed views of the Polish capital were used as guides to reconstruct the historic sections of the city after their destruction in World War II. Bellotto' s style is distinguishable from his uncle's by its Dutch characteristics (e.g., cast shadows, massed clouds, sombre tone and colour).

Bellow, Saul (b. June 10, 1915, Lachine, near Montreal, Que., Can. — d. April 5, 2005, Brookline, Mass., U.S.) Canadian-born U.S. novelist. Bom to an immigrant Russian Jewish family, he was fluent in Yiddish from childhood. His family moved to Chicago when he was nine; he grew up and attended college there and, after some years in New York, returned to teach in Chicago. His works, which make him representative of the Jewish American writers whose works became central to American literature after World War II, deal with the modern urban dweller, disaffected by society but not destroyed in spirit; his originality lay partly in his combination of cultural sophistication and street wisdom. His works include The Adventures of Augie March (1953, National Book Award), Seize the Day (1956), Henderson the Rain King (1959), Herzog (1964, National Book Award), Mr. Sammler's Planet (1970, National Book Award), Humboldt's Gift (1975, Pulitzer Prize), The Dean's December (1982), and Ravelstein (2000). He won the Nobel Prize for Literature in 1976.

bellows Mechanical contrivance for creating a jet of air, consisting usually of a hinged box with flexible sides, which expands to draw in air through an inward opening valve and contracts to expel the air through a nozzle. Invented in medieval Europe, the bellows was commonly used to speed combustion, as in a blacksmith's or ironworker's forge, or to operate reed or pipe organs.

Bellows, George Wesley (b. Aug. 12, 1882, Columbus, Ohio, U.S. — d. Jan. 8, 1925, New York, N.Y.) U.S. painter and lithographer. He studied with Robert Henri at the New York School of Art and became associated with the artists of the Ash Can school. Best known for his boxing scenes, he achieved notoriety with his painting Stag at Sharkey's (1909), which depicts an illegal boxing match. He was one of the organizers of the Armory Show. From 1916 until his death he produced a series of some 200 lithographs, including the well-known Dempsey and Firpo (1924).

Stag at Sharkey s, oil on canvas by George Bellows, 1 909; in the Cleveland Museum of Art, Ohio, U.S.

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Belmondo \bel-mo n -'do\, Jean-Paul (b. April 9, 1933, Neuilly-sur-Seine, near Paris, France) French film actor. After studying in Paris and

performing with provincial stage companies, he appeared in minor film roles before achieving international fame in Jean-Luc Godard’s Breathless (1960). Though not conventionally handsome, he became the leading antihero of New Wave cinema, acting in 25 films by 1963, then went on to appear in such acclaimed films as Pierrot le Fou (1965), Mississippi Mermaid (1969), and Les Miserables (1995).

Bellflower (Campanula)

W.H. HODGE

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Belmont family U.S. family prominent in banking and finance, politics, and patronage of the arts. Its founder in the U.S. was August Belmont (1816-90), a Prussian-bom Jewish banker and diplomat. Belmont entered the Rothschilds’ Frankfurt, Ger., banking house at age 14. In 1837 he moved to New York, where he acted as the Rothschilds’ agent and laid the foundation for his own banking house, which became one of the largest in the country. He took an active interest in politics. Strongly opposed to slavery, he influenced merchants and financiers in England and France in favour of the Union during the Civil War. He introduced Thoroughbred horse racing into the U.S. (see Belmont Stakes). He married the daughter of Commodore Matthew Perry. His son Perry (1850-1947) became a U.S. Congressman and wrote books on U.S. history and politics. Another son, August Belmont, Jr. (1853-1924), took over the banking house and financed the building of New York’s subway, while his wife, Eleanor, supported the Metropolitan Opera.

Belmont Stakes Oldest of the three U.S. horse races that constitute the Triple Crown. The Belmont originated in 1 867 and is named after August Belmont (see Belmont family). The stakes is held in early June at Belmont Park, near Garden City, Long Island; the course is 1.5 mi (2,400 m).

Belmopan \ 1 bel-mo-'pan\ City (pop., 2000: 8,130), capital of Belize. It lies in the Belize River valley, 50 mi (80 km) inland from the former capital, Belize City. After a hurricane did extensive damage to low-lying Belize City, the new capital site was chosen far enough inland to avoid flooding. Construction began in 1966, and Belmopan became the capital in 1970.

Belo Horizonte \'ba-lo-re-'zo n n-te\ City (pop., 2003 est.: city, 2,305,800; metro, area, 5,100,359), southeastern Brazil. Capital of Minas Gerais state, it lies on the western slope of the Serra do Espinha^o at an elevation of 2,720 ft (830 m). The site was chosen in the late 19th century to accommodate expansions that the former capital could not. Brazil’s first planned city, it was laid out on a grid following the models of

Washington, D.C., and La Plata, Arg. It is the hub of a large agricultural region and the area’s commercial and industrial centre.

Belorussia See Belarus

Belorussian language See Belarusian language
Belsen See Bergen-Belsen

Belshazzar \bel-'sha-z3r\ (d. c. 539 bc) Coregent of Babylon. Though he is referred to in the book of Daniel as the son of Nebuchadrezzar, Babylonian inscriptions suggest that he was the eldest son of King Nabonidus. When the king went into exile in 550 bc, the kingdom and most of its army were entrusted to Belshazzar. In the biblical story Belshazzar holds a last great feast at which he sees a hand writing on a wall the Aramaic words “ mene , mene, tekel, upharsin ,” which Daniel interprets as a judgment from God foretelling the fall of Babylon. Belshazzar died after Babylon fell to the Persians in 539 bc.

belt drive Pair of pulleys attached to usually parallel shafts and connected by an encircling flexible belt (band) that can serve to transmit and modify rotary motion from one shaft to the other. Most belt drives consist of flat leather, rubber, or fabric belts running on cylindrical pulleys or of belts with a V-shaped cross section running on grooved pulleys. Another type of belt, used on some internal-combustion engines for connecting the crankshaft and camshafts, is the toothed (or timing) belt, a flat belt with evenly spaced transverse teeth that fit in matching grooves on the periphery of the pulley.

Beltane Vbel-tan, 'bel-tin\ or Beltine \'bel-tin\ or Cetsamain Vket-.sau-nA In Celtic religion, a festival held on the first day of May, celebrating the beginning of summer and open pasturing. Beltane was one of two turning points in the year, the other being November 1 (Samhain), the start of winter. At both, the bounds between the human and supernatural worlds were erased. On May Eve, witches and fairies roamed freely, and measures had to be taken against their enchantments. As late as the 19th century in Ireland, cattle were driven between two bonfires on Beltane as a magical means of protecting them from disease. See also Halloween.

Belter, John Henry orig. Johann Heinrich Belter (b. 1804, Germany — d. 1863, New York, N.Y., U.S.) German-born U.S. cabinetmaker and designer. Trained in Germany, he settled in New York City in 1833. He opened a fashionable shop specializing in rosewood, walnut, and mahogany furniture. In 1854 he patented his invention of processing rosewood in many layers to achieve thin panels that, once shaped in molds through steam heating, could be finely carved. He opened a large factory in 1858, but soon competitive French imports and economic troubles associated with the American Civil War impaired his business, and the firm closed in 1867.

beluga \bo-Tu-g9\ or hausen \'hau-z 3 n\ Large species of sturgeon {Huso huso, or Acipenser huso) that inhabits the Caspian and Black seas and the Sea of Azov. It reaches a length of 25 ft (7.5 m) and a weight of 2,900 lbs (1,300 kg), but its flesh and caviar are less valuable than those of smaller species.

beluga or white whale Species {Delphinapterus leucas) of whale

found in the Arctic Ocean and adjacent seas, in both deep offshore and coastal waters. It may also enter rivers that empty into far northern seas. A toothed whale with a rounded forehead and no dorsal fin, the beluga is about 13 ft (4 m) long. Bom dark blue-gray or blackish, it fades to white or cream at 4-5 years of age. It feeds on fish, cephalopods, and crustaceans and usually lives in groups of five to 10. It has been hunted commercially for its oil, hide, and flesh, and is used in the Arctic as food for humans and dogs.

Beluga, or white whale (Delphinapterus leucas).

E.R. DEGGINGER

belvedere Roofed architectural structure, freestanding or attached, and open on one or more sides. It is built in an elevated position to provide a view and capture daylight and fresh air. Used in Italy since the Renaissance, it often assumes the form of a loggia. The term is often used for a gazebo on top of a building, especially the glazed viewing room of a Victorian dwelling.

Belvedere Torso Hellenistic marble torso of a male figure 5 ft 3 in. (1.6 m) high seated on a rock. It is named after the Belvedere court in Vatican City, where it once stood; it is now in the Vatican Museum. It is signed by the Greek sculptor Apollonius and possibly dates from the 1 st century bc. Well known by 1500, it had a profound influence on Michelangelo and other Renaissance artists.

bema \'be-mo\ (Greek: “step”) Raised stone platform originally used in Athens as a tribunal where orators addressed the citizens and courts of law. In modern times it is usually a rectangular wooden platform. The bema became a standard fixture in Eastern Orthodox churches, functioning as a stage for the altar and clergy. In synagogues, the bema (or bimah) is a raised platform with a reading desk from which the Torah and passages from the Prophets are read.

Bembo \'bem-,bo\, Pietro (b. May 20, 1470, Venice — d. Jan. 18, 1547, Rome) Italian prelate and linguist. Born into an aristocratic family, he became librarian of St. Mark’s Cathedral and was created a cardinal in 1539. After writing lyric poetry in Latin, he turned to the vernacular, producing Italian poems in imitation of Petrarch and an Italian history of Venice. His Discussions of the Vernacular Language (1525) was one of the earliest books to codify Italian spelling and grammar, and it helped establish the Italian literary language. Bembo successfully advocated the adoption of 14th-century Tuscan as a model for literary Italian.

Ben Ali \ben-'a-le\, Zine el-Abidine (b. Sept. 3, 1938, near Sousse, Tun.) President of Tunisia (from 1987). Trained as a soldier, he headed the defense ministry’s military intelligence section for 10 years (1964-

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74) before entering the foreign service. He served as ambassador to Poland before returning home to hold several domestic government posts, which culminated in a dual appointment as prime minister and interior minister. In 1987 he replaced President Habib Bourguiba, who had been declared medically unfit. He was returned to office in elections in 1989, 1994, 1999, and 2004.

Ben Bella, Ahmed (b. Dec. 25, 1918?, Maghnia, Alg.) First elected president of Algeria. After a French education, he entered the French army and was decorated during World War II (1939 – 45). After the war he took up arms to fight French rule. In 1954 he helped found the National Liberation Front (FLN) and became its political leader. He was imprisoned (1956-62) while the FLN fought for Algerian independence. He took control of the FLN's Political Bureau after his release and was elected president in 1963. He was deposed in a coup in 1965 and imprisoned until 1980. Thereafter he spent 10 years in exile, returning to Algeria in 1990. See also Mohamed Boudiaf; Houari Boumedienne.

Ben-Gurion \ben-'gur-e-9n\, David orig. David Gruen (b. Oct. 16, 1886, Plonsk, Pol., Russian Empire – d. Dec. 1, 1973, Tel Aviv-Yafo, Israel) First prime minister of Israel (1948-53, 1955-63). Introduced to Zionism by his father, Ben-Gurion immigrated to Palestine, then part of the Ottoman Empire, in 1906, hoping to fulfill the Zionist aspiration of building a Jewish state in historic Israel. Expelled by the Ottomans at the outbreak of World War I (1914-18), he traveled to New York, where he married. Following the issuance of the Balfour Declaration, he joined the British army's Jewish Legion and returned to the Middle East. In the 1920s and '30s he led several political organizations, including the Jewish Agency, world Zionism's highest directing body. As Britain became more sympathetic to the interests of the Palestinian Arabs, thereafter restricting Jewish immigration to Palestine, he called on the Jewish community to rise against Britain. However, he again called for Jews to support the Allies during World War II (1939-45), while continuing the clandestine immigration of Jews to Palestine. On the establishment of the State of Israel (1948), he became prime minister and minister of defense. He succeeded in fusing the underground Jewish militias that had fought the British into a national army, which he used successfully to defend against Arab attacks. Unpopular with Britain and the U.S., he found an ally in France – then embroiled in its own war in the Arab world – which helped arm Israel in the period leading to the Suez Crisis (1956). He retired from the premiership in 1963 and from the Knesset (parliament) in 1970. See also Arab-Israeli wars.

Ben Nevis Highest mountain, British Isles. It is located in the Scottish Highlands; its summit, which reaches 4,406 ft (1,343 m), is a plateau of about 100 acres (40 hectares). Snow lies in some parts all year. It consists of a superstructure of volcanic rocks surmounting the ancient schists of the Highlands.

Benares See Varanasi

Benavente y Martinez X.be-no-'ven-te-e-mar-'te-nosV Jacinto (b. Aug. 12, 1866, Madrid, Spain – d. July 14, 1954, Madrid) Spanish dramatist. His most celebrated work. The Bonds of Interest (1907), was based on the Italian commedia dell' arte; his 1913 tragedy La malquerida was

also popular. During the Spanish Civil War he was detained by the authorities for a time, but he reestablished himself in official favour with Lo increible (1941). One of the foremost Spanish dramatists of the 20th century, he continued to write until the end of his life, producing more than 150 plays. He received the Nobel Prize for Literature in 1922.

Bench, Johnny (Lee) (b. December 7, 1947, Oklahoma City, Okla., U.S.) U.S. baseball player. Bench joined the Cincinnati Reds in 1967. During his 17 seasons catching for them (1967-83), he helped lead the team (with Pete Rose and Joe Morgan) to four National League pennants (1970, 1972, 1975, 1976) and two World Series victories (1975, 1976). Batting right-handed, he led the National League in runs batted in three times (1970, 1972, 1974) and twice in home runs (1970, 1972). He is regarded as one of the greatest defensive catchers ever to play the game.

Benchley, Robert (Charles) (b. Sept. 15, 1889, Worcester, Mass., U.S. — d. Nov. 21, 1945, New York, N.Y., U.S.) U.S. drama critic, actor, and humorist. Benchley graduated from Harvard University and joined the staff of Life magazine in 1920. A regular member of the Algonquin Round Table, he was drama critic for The New Yorker 1929-40, for which he also wrote “The Wayward Press” column under the pseudonym Guy Fawkes. He had bit parts in many feature films, but he is best known for

more than 40 short subjects, including How to Sleep (1934, Academy Award). His writing was warmly humorous, his satire sharp but not cruel.

bends See decompression sickness

Bene-lsrael Vben-e-.iz-ra-'eU (Hebrew: “Sons of Israel”) one of three groups of Jews in India. The origins of the Bene-lsrael are uncertain, but because of their observance of certain traditions and lack of observance of others, they are believed to have escaped persecution in Galilee before the 2nd century bce and to have shipwrecked on the coast of India. Seven couples are believed to have survived, without the benefit of a material culture. Isolated from other Jews, they largely assimilated into India’s caste system, though they practiced Jewish dietary laws, circumcised male children on the eighth day, and did not work on Saturday. Present-day Bene-lsrael bear a physical resemblance to the Marathi people and speak Marathi and English. Many have emigrated to Israel.

Benedetto da Maiano Xba-na-'dat-to-da-ma-'ya-noV (b. 1442, Majano, Republic of Venice — d. May 24, 1497, Florence) Italian sculptor active in Florence. He was influenced by Bernardo Rossellino; his marble tomb designs are variants on Rossellino’ s patterns. His masterpiece is a pulpit in Santa Croce in Florence (completed 1485) consisting of five narrative reliefs. He often worked with his brothers, Giovanni and Giuliano, in the design and execution of architectural features such as pilasters, capitals, friezes, and niches. He was also a master of naturalistic portrait busts.

Benedict, Ruth orig. Ruth Fulton (b. June 5, 1887, New York, N.Y., U.S.— d. Sept. 17, 1948, New York City) U.S. anthropologist. She received a Ph.D. under Franz Boas at Columbia University and taught at Columbia from 1924 until her death.

In Patterns of Culture (1934), her most famous work, she emphasized how small a part of the range of possible human behaviour is elaborated or emphasized in any one society.

She described how these forms of behaviour are integrated into patterns or configurations, and she supported cultural relativism, or the judging of cultural phenomena in the context of the culture in which they occur. In The Chrysanthemum and the Sword (1946), she applied her methods to Japanese culture. Her theories had a profound influence on CULTURAL ANTHROPOLOGY.

Benedict of Nursia, Saint (b. c.

480, Nursia, Kingdom of the Lombards — d. c. 547) Founder of the Benedictine monastery at Monte Cassino, Italy, and father of Western monasticism. Born into a prominent family at Nursia in central Italy, he rejected the immoral and profligate life of the rich and became a hermit outside Rome, where he attracted disciples. At his monastery at Cassino he formulated the Benedictine Rule, which became standard in monasteries throughout Europe. The Rule includes a probationary year prior to the vow of obedience and lifelong residence at one monastery, a ban on personal property, an abbot elected for life who appoints all other officers, and a precisely ordered day that includes five to six hours of liturgy and prayer, five hours of manual work, and four hours of scriptural and spiritual reading.

Benedict XII orig. Jacques Fournier (b. Saverdun, near Toulouse, France — d. April 25, 1342, Avignon, Provence) Pope (1334-42). A French cardinal and theologian, he became the third pontiff to reign at Avignon (see Avignon papacy), succeeding John XXII. The bishop of Pamiers and Mirepoix and a zealous inquisitor before his elevation to the papacy, Benedict devoted himself to the reform of the church and its religious orders; he also tried unsuccessfully to prevent the outbreak of the conflict between England and France that became the Hundred Years' War. His bull Benedictus Deus (1336) set forth the doctrine of the beatific vision as a vision of God granted to the souls of the just immediately after death.

Benedict XIII orig. Pedro de Luna (b. c. 1328, Illueca, Kingdom of Aragon — d. 1423, Penfscola, in Valencia) Antipope (1394-1423). A French

Ruth Benedict.

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professor of canon law, he was named a cardinal in 1375. When the Western Schism began in 1378, he supported the antipope Clement VII. Elected pope at Avignon (see Avignon papacy), he refused French pressure to abdicate and was besieged in the papal palace (1398). Benedict escaped to Provence in 1403 and won back the obedience of France. He refused to yield when deposed by the Councils of Pisa (1409) and Constance (1417).

Benedict XIV orig. Prospero Lambertini (b. March 31, 1675, Bologna, Papal States — d. May 3, 1758, Rome) Pope in 1740-58. Nobly bom, he received a doctorate in theology and law. Typical of his pontificate were his promotion of scientific learning and his admonition to those drawing up the Index Librorum Prohibitorum (Index of Forbidden Books) to act with restraint. In the Papal States he reduced taxation, encouraged agriculture, and supported free trade. He maintained conciliatory relations with neighbouring kingdoms. A lifelong active scholar, he founded several learned societies and laid the groundwork for the present Vatican Museum. Bernard Gamier, a French cleric who was counter-antipope (1425-33) while Martin V was pope and Clement VIII was antipope, was also called Benedict XIV.

Benedict XV orig. Giacomo Della Chiesa (b. Nov. 21, 1854, Pegli, Kingdom of Sardinia — d. Jan. 22,

1922, Rome, Italy) Pope (1914-22).

Ordained a priest in 1878, he entered the papal diplomatic service. He was made archbishop of Bologna in 1907 and cardinal in 1914. Elected pope a month after the outbreak of World War I, he tried to follow a policy of strict neutrality and concentrated the church’s efforts on relief. He later made positive efforts toward reestablishing peace, though his principal attempt in 1917 to mediate the war was unsuccessful.

Benedict XVI orig. Joseph Alois Ratzinger (b. April 16,

1927, Marktl am Inn, Ger.) Pope from 2005. He was ordained in 1951 and received a doctorate in theology at the University of Munich in 1953.

Thereafter he pursued a career as a theologian and teacher at various universities. During the Second Vatican Council (1962-65) he served as an expert adviser and an advocate of reform. In 1977 he was appointed archbishop of Munich; three months

later he was made a cardinal. As prefect of the Congregation for the Doctrine of the Faith from 1981 to 2005, he enforced doctrinal uniformity in the church and served as a close adviser of Pope John Paul II. He was faced with numerous challenges when he became pope, including a decline in church attendance and in the number of new priests, deep divisions over the direction of the church, and the lingering effects of a sexual-abuse scandal involving priests in various parts of the world.

Benedictine Member of the Order of St. Benedict, the confederated autonomous congregations of monks and lay brothers who follow the Benedictine Rule, created by St. Benedict of Nursia in the 6th century. The Rule spread slowly in Italy and Gaul. By the 9th century it was nearly universal in northern and western Europe, where Benedictine monasteries became repositories of learning, literature, and wealth. The order declined during the 12th– 15th century, when it was revived with reforms that limited abbots to fixed terms and required monks to make their vows to the congregation rather than a particular house. The Reformation virtually eliminated Benedictines from northern Europe, and they declined elsewhere. In the 19th century another revival strengthened the order in Europe, especially in France and Germany, and led to the establishment of new congregations worldwide.

benefice Vbe-no-fosV System of land tenure first used by the Franks during the 8th century. A Frankish lord leased an estate to a freeman in beneficium (Latin: “for the benefit (of the tenant)”), normally until the death of the lord or tenant, though tenants often succeeded in turning benefices into hereditary holdings. By the 12th century benefice was dying out as a term for land tenure; instead it referred to a church office that carried with it the right of receiving income. A lord or bishop chose a priest, who was granted the benefice in return for the performance of spiritual duties.

beneficiary ^be-no-'fi-she-.er-e, .be-no-'fi-sho-reV Person or entity (e.g., a charity or estate) that receives a benefit from something (e.g., a trust, life-insurance policy, or contract). A primary beneficiary receives proceeds from a trust or insurance policy before any other. A contingent beneficiary receives proceeds upon the occurrence of a specified event, such as the death of the primary beneficiary. A direct beneficiary is a third party whom contracting individuals intend to benefit from a contract; an incidental beneficiary benefits without that being the contracting individuals’ intention.

beneficiation X.be-no-.fi-she-'a-shonX Treatment of raw material (such as pulverized ore) to improve physical or chemical properties in preparation for further processing. Beneficiation techniques include washing, sizing of particulates, and concentration (which involves the separation of valuable minerals from the other raw materials received from a grinding mill). In large-scale operations, various distinguishing properties of the minerals to be separated (e.g., magnetism, wettability, density) are exploited to concentrate the desirable components. Beneficiation also is used in the ceramics and clay industries. See also flotation; mining; min-

eral PROCESSING.

Benelux Economic Union Vbe-ns-.lsksV Economic union of Belgium, the Netherlands, and Luxembourg. The three countries formed a customs union in 1948, and in 1958 they signed the Treaty of the Benelux Economic Union, which became operative in 1960. Benelux became the first completely free international labor market and contributed to the establishment of the European Economic Community.

Benes Vbe-.neshN, Edvard (b. May 28, 1884, Kozlany, Bohemia, Austria-Hungary — d. Sept. 3, 1948, Sezimovo Usti, Czech.) Czechoslovakian statesman. A disciple of Tomas Masaryk, Benes was a founder of modern Czechoslovakia. He served as its first foreign minister (1918-35) and its president (1935-38). Forced to capitulate to Adolf Hitler's demands over the Sudetenland, he resigned. He headed the Czech government-in-exile in England (1940-45), then reestablished a government on his native soil in 1945. Recognizing the need to cooperate with the Soviet Union, he nevertheless refused to sign a new communist constitution and resigned in 1948 shortly before his death.

Benet \bo-'na\, Stephen Vincent (b. July 22, 1898, Bethlehem, Pa., U.S. — d. March 13, 1943, New York, N.Y.) U.S. poet, novelist, and short-story writer. Benet is best known for John Brown's Body (1928, Pulitzer Prize), a long narrative poem on the American Civil War. A Book of Americans (1933), poems written with his wife, the former Rosemary Carr, brought many historical characters to life for American schoolchildren. His story "The Devil and Daniel Webster" (1937) was the basis for a play by Archibald MacLeish, an opera by Douglas Moore (first performed 1939), and two films (1941, 2001).

Bengal \ben-'gol\ Former province, northeastern British India. Generally corresponding to the area inhabited by speakers of the Bengali language, it is now divided between eastern India and Bangladesh. Bengal formed part of most of the early empires that controlled northern India. From the 8th to the 12th century it was under a Buddhist dynasty, and from 1576 it belonged to the Mughal Empire. In the 18th century it was dominated by the nawabs of Bengal; they came into conflict with the British, who had established themselves at Calcutta (now Kolkata) in 1690. By 1764 the British had taken possession, and Bengal became the base for British expansion in India. Bengal was partitioned in 1905, and with the end of British rule in 1947, the western portion formed the Indian states of West Bengal, Bihar, and Orissa. East Bengal went to Pakistan; in 1971 it became Bangladesh. Jharkhand state was created from southern Bihar in 2000.

Bengal, Bay of Part of the Indian Ocean. Occupying about 839,000 sq mi (2,172,000 sq km), it is bordered by Sri Lanka, India, Bangladesh, Myanmar, and the northern Malay Peninsula. It is about 1,000 mi (1,600

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km) wide, with an average depth of more than 8,500 ft (2,600 m). Many large rivers, including the Godavari, Krishna, Kaveri, Ganges, and Brahmaputra, flow into it. The Andaman and Nicobar Islands, the bay's only islands, separate it from the Andaman Sea. It has long been crossed by Indian and Malaysian traders; Chinese maritime trading dates from the 12th century. Vasco da Gama led the first European voyage into the bay in 1498.

Bengal, Partition of (1905) Division of Bengal carried out by Lord Curzon, the British viceroy in India. The British province of Bengal, which also included Bihar and Orissa, had by the beginning of the 20th century grown too large to handle under a single administration. Curzon chose to unite eastern Bengal with Assam, leaving western Bengal with Bihar and Orissa. The partition went through despite widespread protests, unrest, and boycotts, but in 1911 eastern and western Bengal were reunited. Assam resumed its old status, and Bihar and Orissa were separated to form a new province.

Bengali \ben-'ga-le\ language Indo-Aryan iamguage spoken principally in Bangladesh and the Indian state of West Bengal. Bengali has more speakers — some 190 million — than all but a handful of other languages of the world. Like other Modern Indo-Aryan languages, Bengali has drastically reduced the complex inflectional system of Old Indo-Aryan (see Sanskrit language). It has virtually dropped grammatical gender and fixed stress on the initial syllable of a word or phrase. Bengali was the first of the Indian languages to adopt Western secular literary styles, such as fiction and drama.

Benghazi See BanghazT

Beni \'ba-ne\ River River, Bolivia. Rising in the eastern cordillera of the Andes Mountains, it flows north and unites with the Mamore River to form the Madeira River at Villa Bella. Near its mouth it receives the Madre de Dios River. It is 994 mi (1,599 km) long.

Benin \bo-'nen\ officially Republic of Benin formerly Dahomey Country, western Africa. Area: 43,484 sq mi (112,622 sq km). Population (2005 est.): 7,649,000. Capital: Porto-Novo (official), Cotonou (de facto). The Fon people and related groups constitute two-fifths of the population; minorities include the Yoruba, Fulani, and Adjara. Languages: French (official), Fon.

Currency: CFA franc. Religions: traditional religions, Islam, Christianity. Extending about 420 mi (675 km) inland from the Gulf of Guinea, Benin includes a hilly region in the northwest, where the maximum elevation is 2,103 ft (641 m). There are plains in the east and north and a marshy region in the south, where the coastline extends about 75 mi (120 km). Benin's longest river, the Oueme, flows into the Porto-Novo Lagoon and is navigable for 125 mi (200 km) of its 280-mi (450-km) length. Benin has a developing mixed economy based largely on agriculture and operates an offshore oil field. It is a republic

with one legislative house; the head of state and government is the president, assisted by the prime minister. In southern Benin the Fon established the Abomey kingdom in the early 17th century. In the 18th century the kingdom expanded to include Allada and Ouidah, where French forts had been established in the 17th century. By 1882 the French were firmly reestablished in the area, and conflict between the French and Africans ensued. In 1894 Dahomey became a French protectorate; it was incorporated into the federation of French West Africa in 1904. It achieved independence in 1960. Dahomey was renamed Benin in 1975. Its chronically weak economy created problems for the country into the 21st century.

Benin, Bight of Bay, northern section of Gulf of Guinea. It extends along the West African coast about 400 mi (640 km) from Cape St. Paul, Ghana, past Togo and Benin to an outlet of the Niger River in Nigeria. Major ports include Lome, Cotonou, and Lagos. It was the scene of extensive slave trading during the 16th- 19th century, and the region of coastal lagoons west of the Niger delta became known as the Slave Coast. By the 1830s trade in palm oil had become the major economic activity. Petroleum was discovered in the Niger delta in the 1950s.

Benin, kingdom of One of the principal historic kingdoms (12th— 19th century) of the western African forest region. Founded by the Edo people, the kingdom was centred on present-day Benin City in southern Nigeria.With the accession of Ewuare the Great in the mid 15th century, the Benin kingdom was vastly expanded, including the founding of the city of Lagos. The Portuguese first visited Benin in the late 15th century, and, for a time, Benin traded ivory, palm oil, pepper, and slaves with Portuguese and Dutch traders. Benin stopped trading slaves with Europeans in the 18th century and focused attention on dependent regions around it. Succession struggles in the 18th and 19th centuries put a series of weaker kings on the throne. After the British attacked and burned Benin City in 1897, the kingdom was incorporated into British Nigeria.

Benjamin, Judah P(hilip) (b.

Islands — d. May 6, 1884, Paris,

France) Prominent lawyer in the U.S. and Britain and member of the Confederate cabinet. He moved with his parents from St. Croix to South Carolina in his early youth. In 1832 he began building a successful law practice in New Orleans. He was the first Jew elected to the U.S. Senate (1853-61), where he was noted for his proslavery speeches. After the South seceded, Jefferson Davis appointed him attorney general (1861), secretary of war (1861-62), and secretary of state (1862-65).

Late in the war he enraged many white Southerners by urging that slaves be recruited into the Confederate army and emancipated after their term of service. At the end of the war he escaped to England,

where he was called to the bar (1866) and served as queen’s counsel (1872).

Benjamin \'ben-ya-,men,\ English Vben-jo-monX, Walter (b. July 15, 1892, Berlin, Ger. — d. Sept. 26, 1940, near Port-Bou, Spain) German literary critic. Born into a prosperous Jewish family, Benjamin studied philosophy and worked as a literary critic and translator in Berlin from 1920 until 1933, when he fled to France to avoid persecution. The Nazi takeover of France led him to flee again in 1940; he committed suicide at the Spanish border on hearing that he would be turned over to the Gestapo. Posthumous publication of his essays has won him a reputation as the leading German literary critic of the first half of the 20th century; he was also one of the first serious writers about film and photography. His independence and originality are evident in the essays collected in Illuminations (1961) and Reflections (1979). His writings on art reflect his reading of Karl Marx and his friendships with Bertolt Brecht and Theodor Adorno.

Aug. 6, 1811, St. Croix, Virgin

Judah Benjamin

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Benn, Gottfried (b. May 2, 1886, Mansfeld, Ger. — d. July 7, 1956, Berlin) German poet and essayist. He received military medical training and was made medical supervisor of jail inmates and prostitutes in occupied Brussels during World War I. His early poems, including those in Fleisch (1917; “Flesh”), contain allusions to degeneracy and medical aspects of decay. Because of his Expressionism and despite his right-wing views, he was penalized during the Nazi era. He regained literary attention with Statische Gedichte (1948; “Static Poems”) and the reappearance of his old poems. A broad selection of his poetry and prose was published in English as Primal Vision (1961).

Bennett, Alan (b. May 9, 1934, Leeds, Yorkshire, Eng.) British dramatist, screenwriter, and actor. He first gained success with the brilliant satirical revue Beyond the Fringe (1960), which he cowrote and performed with Dudley Moore, Peter Cook, and Jonathan Miller. His first stage play. Forty Years On (1968), was followed by plays such as Getting On (1971) and Enjoy (1980). He later wrote works for television, including An Englishman Abroad (1982) and Talking Heads (1988), which were marked by his characteristic mixture of wry comedy and sadness. His screenplays include Prick Up Your Ears (1987). His successful play

The Madness of King George (1991) was made into an acclaimed film in 1994.

Bennett, (Enoch) Arnold (b. May 27, 1867, Hanley, Staffordshire, Eng. — d. March 27, 1931, London) English novelist, playwright, critic, and essayist. His major works, inspired by Gustave Flaubert and Honore de Balzac, form an important link between the English novel and the mainstream of European realism. He is best known for his highly detailed novels of the “Five Towns” — the Potteries in his native Staffordshire — which are the setting of Anna of the Five Towns (1902), The Old Wives' Tale (1908), and the three novels that make up The Clayhanger Family (1925). He was also a well-known critic.

Bennett, James Gordon (b. Sept. 1, 1795, Newmill, Banffshire, Scot. — d. June 1, 1872, New York, N.Y., U.S.) Scottish-born U.S. editor. He immigrated to the U.S. in 1819 and was employed on various newspapers until 1835, when he started The New York Herald. The paper became very successful and introduced many of the methods of modern news reporting. Among other innovations, Bennett published the first Wall Street financial article (1835), established the first correspondents in Europe (1838), maintained a staff of 63 war correspondents during the Civil War, was a leader in using illustrations, introduced a society department, and published the first account in U.S. journalism of a love-nest murder (1836).

Bennett, Michael orig. Michael Bennett Difiglia (b. April 8, 1943, Buffalo, N.Y., U.S. — d. July 2, 1987, Tucson, Ariz.) U.S. dancer, choreographer, and stage musical director. He began dancing at age three and left high school to tour in a production of West Side Story'. His major contribution to dance was as choreographer-director of Broadway musicals such as Promises, Promises (1968), Company (1970), Follies (1971), and Dreamgirls (1981). His most remarkable musical was A Chorus Line (1975, Pulitzer Prize), which he conceived, directed, and choreographed. Bennett personally received eight Tony awards during his career.

Bennett (of Mickleham and of Calgary and Hopewell), Richard Bedford Bennett, Viscount (b. July 3, 1870, Hopewell, N.B., Can. — d. June 27, 1947, Mickleham, Surrey, Eng.) Canadian prime minister (1930-35). Bennett was admitted to the bar in 1893 and practiced in New Brunswick. He then moved west and served in the legislatures of the Northwest Territories and Alberta and in the Canadian House of Commons (1911). He was named director general of national service (1916) and later minister of justice (1921). He became head of the Conservative Party in 1927 and, promising relief from the Great Depression, prime minister in 1930. But he underestimated the severity of the crisis, and his measures were ineffective. He was defeated by the Liberals under W.L. Mackenzie King. In 1939 he retired to England, where he was made a viscount in 1941.

Bennett, Tony orig. Anthony (Dominick) Benedetto (b. Aug. 3, 1926, Astoria, Queens, N.Y., U.S.) U.S. popular singer. His first job was as a singing waiter, and he later sang under the name Joe Bari. In 1949 Pearl Bailey asked him to join her nightclub revue, and in 1950 Bob Hope suggested his new name. He had many hits in the 1950s, but “I Left My Heart in San Francisco” (1962) became his signature song. His style grew increasingly jazz-oriented over the years, and in the mid-1990s a special appearance on MTV heralded his comeback.

Benny, Jack orig. Benjamin Kubelsky (b. Feb. 14, 1894, Chicago, 111., U.S. — d. Dec. 27, 1974, Beverly Hills, Calif.) U.S. comedian. He took up the violin as a boy and played it in vaudeville from 1912. After discovering a talent for comedy while in the navy, he returned to vaudeville as a comedian. He made his film debut in 1927 and appeared in 18 films in the years 1930-45. His weekly Jack Benny Program on radio (1932—55) and television (1950-65) won loyal audiences, and he became famous for a unique comic style characterized by subtle verbal inflection, meaningful pauses, seriocomic violin playing, and the stage image of a vain, stingy man.

Benois Vbyi-n6i\, Alexandre (Nikolayevich) (b. May 4, 1870, St. Petersburg, Russia — d. Feb. 9, 1960, Paris, Fr.) Russian theatre art director, painter, and influential ballet set designer. With Sergey Diaghilev he cofounded the avant-garde art magazine Mir Iskusstva (“World of Art”) in 1899. He began his scenic-design career in 1901 and designed many of the innovative Ballets Russes decors from 1909 to 1929. He designed sets for numerous other ballet companies in the 1940s and 1950s.

Benoue River See Benue River

bent grass Any of the annual or perennial GRASSes that make up the genus Agrostis, in the family Poaceae (or Gramineae), found in temperate and cool regions and at high altitudes in subtropical and tropical areas. At least 40 species are found in the U.S.; some are weeds, others forage and turf plants. They have slender stems and flat blades. Many spread by creeping stolons. Redtop (A. gigantea) is a hay and pasture grass.

Creeping bent (A. stolonifera variety palustris) and colonial bent (A. tenuis) are popular lawn grasses; the many strains of both species are planted in golf courses and bowling greens, where they are closely cut to develop a fine, spongy, firm turf.

Bentham Vben-thomV Jeremy (b. Feb. 15, 1748, London, Eng. — d.

June 6, 1832, London) British moral philosopher and legal theorist, the earliest expounder of utilitarianism. A precocious student, he graduated from Oxford at age 15. In his An Introduction to the Principles of Morals and Legislation, he argued that mankind was governed by two sovereign motives, pain and pleasure. The object of all legislation, therefore, must be the “greatest happiness of the greatest number”; and since all punishment involves pain

and is therefore evil, it ought only to be used “so far as it promises to exclude some greater evil.” His work inspired much reform legislation, especially regarding prisons. He was also an exponent of the new laissez-faire economics of Adam Smith and David Ricardo. Though a vocal advocate of democracy, he rejected the notions of the social contract, natural law, and natural rights as fictional and counterproductive (“Rights is the child of law; from real law come real rights; but from imaginary laws, from ‘law of nature,’ come imaginary rights”). He helped found the radical Westminster Review (1823).
clothed skeleton is permanently exhibited at University College, London.

Bentham, Sir Samuel (b. Jan. 11, 1757, England — d. May 31, 1831, London) British engineer, naval architect, and navy official. He was the

Creeping bent (Agrostis stolonifera variety palustris)

R.G. DOORD-THE NATURAL HISTORY PHOTOGRAPHIC AGENCY/EB INC.

Jeremy Bentham, detail of an oil painting by H.W. Pickersgill, 1 829; in the National Portrait Gallery, London

COURTESY OF THE NATIONAL PORTRAIT GALLERY, LONDON

In accordance with his will, his

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brother of Jeremy Bentham and father of the botanist George Bentham (1800-84). An early advocate of explosive-shell weapons for warships, Bentham led Russian vessels fitted with shell guns to victory over a larger Turkish force in 1788. In England he developed the Arrow class of sloops used against France. He served as commissioner of the navy (1807-12).

Bentinck, William (Henry Cavendish), Lord (b. Sept. 14, 1774, Bulstrode, Buckinghamshire, Eng. — d. June 17, 1839, Paris, France) British colonial administrator. Born to wealth and rank, he was appointed governor of Madras in 1803. Recalled in 1807 after a mutiny of Indian troops at Vellore, he pressed for the next 20 years for a chance to vindicate his name. In 1828 he was named governor-general of Bengal (in effect, of all India), and he served until 1835. He reformed the country's finances, opened up administrative and judicial posts to Indians, suppressed bands of assassins known as thugs, and abolished suttee. His policies helped pave the way to independence more than a century later.

Bentley, Eric (Russell) (b. Sept. 14, 1916, Bolton, Lancashire, Eng.) British-born U.S. drama critic and translator. He was a stage director in several European cities (1948-51); in Munich, after working with Bertolt Brecht on a production of the playwright's Mother Courage , he translated Brecht's plays into English. His reporting on European theatre for several magazines helped introduce many European playwrights to the U.S. He wrote numerous critical works, including Life of the Drama (1964), and taught at Columbia University (1953-69) and elsewhere.

Bentley, Richard (b. Jan. 27, 1662, Oulton, Yorkshire, Eng. — d. July

14, 1742, Cambridge, Cambridgeshire) English clergyman and classical scholar. He was appointed Boyle lecturer at Oxford in 1692, became keeper of the Royal Library in 1694, and was named master of Trinity College, Cambridge, in 1700. He displayed his skill in textual emendation and his knowledge of ancient metre in Epistola ad Joannem Millium (1691). In Dissertation on the Epistles of Phalaris (1699), he proved the epistles to be spurious; his dispute with Charles Boyle over their authenticity was satirized by Jonathan Swift in The Battle of the Books (1704). He also published critical texts of classical authors, including Horace, and made linguistic contributions to the study of ancient Greek.

Benton, Thomas Hart (b. March 14, 1782, near Hillsborough, N.C., U.S. — d. April 10, 1858, Washington, D.C.) U.S. politician. After moving to St. Louis, Mo. (1815), he became editor of the St. Louis Enquirer. Appealing to agrarian and commercial interests, he won election to the U.S. Senate in 1820. He became a crusader for the distribution of public lands to settlers and was soon acknowledged as the chief spokesman in the Senate of the early Democratic Party. His opposition to the extension of slavery into the West cost him his Senate seat in 1851, though he later served in the House of Representatives (1853-55). His grandnephew was the artist Thomas Hart Benton.

Benton, Thomas Hart (b. April

15, 1889, Neosho, Mo., U.S.— d. Jan. 19, 1975, Kansas City, Mo.) U.S. painter and muralist. He studied at the Art Institute of Chicago and at the Academie Julian in Paris, where he came into contact with Synchromism

and Cubism. In 1912 he returned to the U.S. and settled in New York City. Failing in his attempts at Modernism, he set out to travel through the rural heartland, sketching people and places. In the 1930s he painted several notable murals, including America Today (1930-31) at the New School for Social Research. He often transposed biblical and classical stories to rural American settings, as in Susanna and the Elders (1938). His style, which quickly became influential, is characterized by undulating forms, cartoonlike figures, and brilliant colour. He taught at the Art Students League in New York, where Jackson Pollock was his best-known student.

Benton, William (Burnett) (b. April 1, 1900, Minneapolis, Minn., U.S. — d. March 18, 1973, New York, N.Y.) U.S. publisher, advertising executive, and government official. A descendant of missionaries and educators, he founded, with Chester Bowles, the successful New York advertising agency of Benton & Bowles. He later became a vice president of the

University of Chicago; through his efforts, the university acquired Encyclopaedia Britannica, which he managed and later purchased. In 1945 he became assistant secretary of state, and he later briefly served in the U.S. Senate (1949-52). Thereafter he devoted sustained attention to the encyclopaedia; he died shortly before the publication of its 15th edition.

bentwood furniture Type of furniture made of wooden rods bent into shape after being heated with steam.

The method was used on the 18th-century Windsor chair, but its principal exponent was Michael Thonet, who exploited its possibilities in the 1840s. His bentwood chairs are among the most successful examples of early mass-produced furniture.

Bentwood is light, comfortable, and inexpensive, as well as strong and graceful.

Benue-Congo \'ba-nwa\ languages Largest branch of the Niger-Congo language family, both in numbers of languages (900) and speakers (at least 500 million). Its major divisions are Defoid, including Yoruba, with more than 20 million speakers; Edoid, including Edo (see kingdom of Benin); Nupoid, including Nupe, Ebira, and Gbagyi;

Idomoid, including Idoma; Igboid, including the many dialects of the approximately 19 million Igbo people; Kainji, with 40 languages;

Platoid, a congeries of 50 languages;

Cross River, a group of more than 55 languages; and Bantoid. The largest

branch, Bantoid, comprises a North-
ern and a Southern group and includes more than 500 languages, 47 of which are spoken by more than 1 million people. The Bantu languages make up the largest subgroup of Southern Bantoid.

Benue \'ba-nwa\ River or Benoue \ba-'nwa\ River River, western Africa. Rising in northern Cameroon (as the Benoue), the river flows west across east-central Nigeria (as the Benue). About 870 mi (1,400 km) long, it is the chief tributary of the Niger River and transports a considerable volume of trade.

Benz \ 'bents \, Karl (Friedrich) (b. Nov. 25, 1844, Karlsruhe, Baden — d. April 4, 1929, Ladenburg, Ger.) German mechanical engineer who designed and built the first practical automobile powered by an internal-combustion engine. The original car, his three-wheeled Motor-wagen, first ran in 1885. Benz's company produced its first four-wheeled car in 1893 and the first of its series of racing cars in 1899. Benz left the company in 1906 to form another group with his sons. In 1926 the Benz company merged with the company started by Gottlieb Daimler.

benzene Simplest aromatic hydrocarbon (see aromatic compound), par-
ent substance of a large class of chemical compounds. It was discovered in 1825 by Michael Faraday. The chemical formula is C 6 H 6 ; August Kekule von Stradonitz in 1865 was the first to propose the correct structure, a six-membered ring of carbon atoms, each with one hydrogen atom bonded to it (see bonding). Although benzene is often represented with alternat-
ing single and double bonds between carbon atoms, the electrons in the bonds are shared or delocalized in such a way as to make all carbon-carbon bonds alike. Benzene is a colourless, mobile liquid with a char-
acteristic odour. An excellent solvent, it is also widely used as a starting material for many plastics, dyes, detergents, insecticides, and other indus-
trial chemicals. Benzene is highly toxic, and long exposure may cause LEUKEMIA.

Benzer, Seymour (b. Oct. 15, 1921, New York, N.Y., U.S.) U.S. molecular biologist. He received his Ph.D. from Purdue University. He developed a method for determining the detailed structure of viral genes and coined the term cistron to denote functional subunits of genes. He did much to explain the nature of genetic oddities, called nonsense mutations, in terms of the nucleotide sequence of DNA, and he discovered a rever-
sal, or suppression, of these mutations in certain bacteria.

Bent beechwood armchair by the Tho-
net brothers, Austria, c. 1 870; in the Museum of Modern Art, New York City

COURTESY OF THE MUSEUM OF MODERN ART, NEW YORK,
GIF OF THONF INDUSTRIES

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Beowulf Vba-3-,wulf\ Heroic poem considered the highest achievement of Old English literature and the earliest European vernacular epic. It deals with events of the early 6th century and was probably composed c. 700-750. It tells the story of the Scandinavian hero Beowulf, who gains fame as a young man by vanquishing the monster Grendel and Grendel's mother; later, as an aging king, he kills a dragon but dies soon after, honoured and lamented. Beowulf belongs metrically, stylistically, and thematically to the Germanic heroic tradition but shows a distinct Christian influence.

Berain \ba-'ra n \, Jean, the Elder (b. Oct. 28, 1637, Saint-Mihiel, Fr. — d. Jan. 24, 1711, Paris) French decorator and designer. Trained under Charles Le Brun, he was appointed chief designer to the court of Louis XIV in 1674. He was skilled in designing tapestries, accessories, furniture, costumes, and elaborate stage settings for operas and extravagant theatrical productions; these were typically filled with fantastic iconography. He satisfied the king's appetite for splendour and inspired other cabinetmakers such as Andre-Charles Boulle.

Berar \ba-'rar\ Historical region, west-central India. Located in what is now northern Maharashtra state, Berar emerged as a distinct political entity after the incursions of Muslim armies in the 13th century ad. It formed part of several Muslim kingdoms until, on the breakup of the Mughal Empire, it fell to the ruler of Hyderabad. Coming under British control in 1853, it was subsequently assigned to various provinces; it has been part of Maharashtra state since 1960. The region includes a rich cotton-growing area in the Purna River basin.

Berber Any member of a community native to the Maghrib who speaks one of various Berber languages, including Tamazight, Tashahit, and Tarifit. Berber-speakers were the original inhabitants of North Africa, though many regions succumbed to colonization by the Roman Republic and Empire and later (from the 7th century ad) to conquest by the Arabs. Berbers gradually accepted Islam, and many switched to Arabic or became bilingual. Berber languages are still spoken in some rural and mountain areas of Morocco and Algeria and by some inhabitants of Tunisia and Libya. Since the 1990s Berber intellectuals have sought to revive interest in the language. The Berber-speaking Almoravid and Almohad dynasties built empires in North Africa and Spain in the 1 1th— 13th centuries. See also Abd el-Krim; Kabyle; Rif.

Berbice \bor-'bes\ River River, eastern Guyana. Rising in Guyana's highlands, it flows northward 370 mi (595 km) through dense forests to the Atlantic Ocean. Its basin is restricted by the proximity of the larger Essequibo and Courantyne rivers. Its name derives from a Dutch colony that became part of British Guiana (now Guyana) in 1831.

Berchtesgaden \'berk-t3s-,gad- 3 n\ Town (pop., 1992 est.: 8,000), southern Germany. Located in the Bavarian Alps south of Salzburg, it is surrounded on three sides by Austrian territory. Once part of Austria, it passed to Bavaria in the early 19th century. It was the site of Adolf Hitler's villa retreat before and during World War II. In 1938 he met there with Neville Chamberlain. Destroyed by bombing in 1945, the villa was leveled in 1952. Mountain climbing and skiing make the area a popular

destination.

Berchtold Vberk-,tolt\, Leopold, count von (b. April 18, 1863, Vienna, Austria — d. Nov. 21, 1942, near Csepreg, Hung.) Austro-Hungarian politician. One of the richest men in Austria-Hungary, he entered the diplomatic service in 1893 and became foreign minister in 1912. After the assassination of Archduke Francis Ferdinand in 1914, Berchtold delivered an ultimatum to Serbia that led to the outbreak of World War I. He was forced to resign in 1915.

Berengar of Tours \'ber-3n- l gar...'tur\ (b. c. 999, Tours, Touraine — d. Jan. 10, 1088, priory of Saint-Cosme, near Tours) French theologian. He became canon of Tours Cathedral and archdeacon of Angers (c. 1040). He rejected the prevailing eucharistic theology and argued against any material change to the bread and wine. He was opposed by numerous theologians, most notably Lanfranc, and may have been excommunicated (1050) by Pope Leo IX. He was condemned by the Council of Vercelli (1050) and the Synod at Paris (1051). After a compromise, he was again condemned in 1076, 1078, 1079, and 1080 and spent the rest of his life in ascetic solitude.

Berenson Vber-on-sonV, Bernard (b. June 26, 1865, Vilnius, Lithuania, Russian Empire — d. Oct. 6, 1959, Settignano, Italy) Lithuanian-born U.S. art historian, critic, and connoisseur. He grew up in Boston and

attended Harvard University, but for most of his life he lived in Italy, where he built a reputation as an authority on Italian Renaissance painting. He was adviser to the art dealer Joseph Duveen (1869-1939) and to Isabella Stewart Gardner (1840-1924), founder of Boston’s Gardner Museum. Berenson bequeathed his villa, I Tatti (near Florence), with its art collection and outstanding library, to Harvard to be administered as the Harvard Center for Italian Renaissance Studies. His books include The Drawings of the Florentine Painters (1903, 1938, 1961) and Italian Painters of the Renaissance (1952).

Berezina River \b3-'raz- 3 n-3\ River, Belarus. It is 365 mi (587 km) long and flows southeast into the Dnieper River. During Napoleon’s retreat from Moscow in 1812, a bitter engagement was fought on the Berezina at the crossroads of the river near Baryslaw, and Russian forces inflicted enormous losses on Napoleon’s army. In 1941 it was the scene of fierce fighting during the German advance on Smolensk.

Berg Vberk\ Former duchy, Holy Roman Empire. Located on the Rhine River, the area now lies in the districts of DOsseldorf and Cologne, Germany. In the 11th century the counts of Berg acquired Westphalian lands east of Cologne; these were incorporated into a duchy in 1380. Berg became a leading iron and textile manufacturing centre in the 17th— 1 8th centuries. In 1806 Napoleon made it a grand duchy in his Confederation of the Rhine. Following the Congress of Vienna in 1814 — 15, it became part of Prussia.

Berg \'berk\, Alban (Maria Johannes) (b. Feb. 9, 1885, Vienna, Austria-Hungary — d. Dec. 24, 1935, Vienna, Austria) Austrian composer. He was largely self-taught musically until he met Arnold Schoenberg at age 19. This would prove to be the decisive event in his life, and Schoenberg would remain his teacher for eight years. Under his influence, Berg’s early late-Romantic tonal works gave way to increasing atonality and

finally (1925) to 12-tone composition. His Expressionist opera Wozzeck (1922) would become the most universally acclaimed post-Romantic opera. His second opera. Lulu, on which he worked for six years, remained unfinished at his death. Berg's other works include two string quartets, including the Lyric Suite (1926); Three Pieces for Orchestra (1915); and a violin concerto (1935).

Berg, Paul (b. June 30, 1926, New York, N.Y., U.S.) U.S. biochemist. He received his Ph.D. from Western Reserve University. While studying the actions of isolated genes, he devised methods for splitting DNA molecules at selected sites and attaching the resulting segments to the DNA of a virus or plasmid, which could then enter bacterial or animal cells. The foreign DNA was incorporated into the host and caused the synthesis of proteins not ordinarily found there. One of the earliest practical results of this research was the development of a strain of bacteria that contained the gene for producing insulin. In 1980 Berg shared a Nobel Prize with Walter Gilbert (b. 1932) and Frederick Sanger.

bergamot Vbor-go-.maA Any of several North American perennial plants of the mint family, also known as bee balm, fragrant balm, and Indian's plume. The leaves are used as an herb to flavour tea, punches, lemonade, and other cold drinks. Monarda didyma , native to the U.S., is made into Oswego tea, a beverage used by the American Indian Oswego tribe and said to be the drink adopted by the 1 8th-century colonists during their boycott of British tea. The pear-shaped fruit of the bergamot orange (Citrus bergamia), found chiefly in Calabria, Italy, is valued by the flavouring and perfume industries for the essential oil extracted from its peel. The bergamot pear, a popular winter pear cultivated in Britain, is a large, round fruit with yellowish green skin.

Bergen City (pop., 2000 est.: municipality, 229,496), southwestern Norway. It is Norway's second largest city and most important port. Founded in 1070 by King Olaf III, it was Norway's capital in the 12th— 1 3th centuries. In the 14th century, German Hanseatic League merchants acquired control over its trade; their influence in a weakened Norway lasted into the 16th century. Repeatedly destroyed by fire (most notably in 1702 and 1916), Bergen has been resurrected each time. Its economy is based largely on fishing and shipbuilding. It was the birthplace of Edvard Grieg and the violinist Ole Bull.

Bergen, Edgar orig. Edgar John Bergren (b. Feb. 16, 1903, Chicago, 111., U.S. — d. Sept. 30, 1978, Las Vegas, Nev.) U.S. comedian and ventriloquist. As a boy he developed the skill in ventriloquism that he later used to earn his tuition at Northwestern University. After stints in vaudeville and nightclubs, he took his act to radio, where the Edgar Bergen-

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Charlie McCarthy Show (with his caustic and irrepressible dummy Charlie McCarthy) was one of the most popular programs for 20 years (1937-57). His daughter, Candice (b. 1946), was a successful screen and

television actress.

Bergen-Belsen or Belsen Nazi concentration camp near Bergen and Belsen, villages in what was then Prussian Hannover, Germany. Established in 1943 partly as a prisoner-of-war camp and partly as a Jewish transit camp, it was designed for 10,000 prisoners but eventually held about 60,000, most of whom lacked any food or shelter. It contained no gas chambers, but some 35,000 prisoners died there, including Anne Frank, between January and mid- April 1945. As the first such camp to be liberated by the Western Allies (April 15, 1945), it received instant notoriety. Some 28,000 prisoners died of diseases and other causes in the weeks after their liberation by British troops.

Berger, Victor (Louis) (b. Feb. 28, 1860, Nieder-Rehbach, Austria-Hungary — d. Aug. 7, 1929, Milwaukee, Wis., U.S.) Cofounder of the U.S. Socialist Party. He immigrated to the U.S. from Austria-Hungary in 1878, founded a German-language newspaper in 1892, and edited the Social Democratic Herald (later Milwaukee Leader) from 1898 to 1929. With Eugene V. Debs he founded the Social Democratic Party, which became the Socialist Party in 1901. He served in the U.S. House of Representatives (1911-13) as the first Socialist ever elected to Congress. Elected again in 1918, he was denied his seat after being convicted under the Espionage Act for opposing U.S. participation in World War I. His conviction was overturned, and he again served in the House (1923-29) and succeeded Debs as Socialist Party chairman (1927-29).

Bergerac, Savinien Cyrano de See Savinien Cyrano de Bergerac

Bergey Vbar-geV David Hendricks (b. Dec. 27, 1860, Skippack, Pa., U.S. — d. Sept. 5, 1937, Philadelphia, Pa.) U.S. bacteriologist. He taught school before attending the University of Pennsylvania, where he earned a doctorate in public health. He subsequently became director of biological research for the National Drug Company in Philadelphia. He is best remembered as the primary author of Bergey’ s Manual of Determinative Bacteriology, a reference for classification of bacteria, and he researched such varied topics as tuberculosis, food preservatives, phagocytosis (engulfment of particles by cells), and allergic reactions.

Bergman, (Ernst) Ingmar (b. July 14, 1918, Uppsala, Swed.) Swedish film writer-director. The rebellious son of a Lutheran pastor, he worked in the theatre before directing his first film, Crisis (1945). He won international acclaim for his films The Seventh Seal (1956) and Wild Strawberries (1957). He assembled a group of actors, including Max von Sydow and Liv Ullmann, and a cinematographer, Sven Nykvist, with whom he made powerful films often marked by bleak depictions of human loneliness, including Through a Glass Darkly (1961), Cries and Whispers (1972), Autumn Sonata (1978), and Fanny and Alexander (1982). He later wrote screenplays for The Best Intentions (1992) and Private Confessions (1996). Throughout his career Bergman continued to direct stage productions, usually at Stockholm’s Royal Dramatic Theatre.

Bergman, Ingrid (b. Aug. 29, 1915, Stockholm, Swed. — d. Aug. 29, 1982, London, Eng.) Swedish film and stage actress. After appearing in Intermezzo in Sweden, she went to the U.S. to act in the English-language version (1939). Her radiance and unaffected charm made her a star in films such as Casablanca (1942), Gaslight (1944, Academy Award), and Alfred Hitchcock’s Spellbound (1945) and Notorious (1946). The scandal caused by her love affair with Roberto Rossellini (1949) kept her off the U.S. screen

for seven years, and she made films in Europe before being welcomed back to Hollywood in Anastasia (1956, Academy Award). Her later films include Indiscreet (1958) and Murder on the Orient Express (1974, Academy Award).

Bergson \berk-'so n \, Henri (-Louis) (b. Oct. 15, 1859, Paris, France — d. Jan. 4, 1941, Paris) French philosopher. In Creative Evolution (1907), he argued that evolution, which he accepted as scientific fact, is not mechanistic but driven by an elan vital ("vital impulse"). He was the first to elaborate a process philosophy, rejecting static values and embracing dynamic values such as motion, change, and evolution. His writing style has been widely admired for its grace and lucidity; he won the Nobel Prize for Literature in 1927. Very popular in his time, he remains influential in France. See photograph opposite.

Beria Vber-e-9\, Lavrenty (Pavlovich) (b. March 29, 1899, Merkheuli, Russia — d. Dec. 23, 1953, Moscow, Russia, U.S.S.R.) Soviet politician and director of the Soviet secret police. He worked in intelligence and counterintelligence activities from 1921. As Communist Party head of the Transcaucasian republics (1932-38), he personally oversaw the political purges initiated by Joseph Stalin (see purge trials). He was head of the Soviet secret police (1938-53), and after Stalin's death he became one of four deputy prime ministers and the head of the Ministry of Internal Affairs. After attempting to succeed Stalin as sole dictator, he was arrested and executed.

beriberi \,ber-e-'ber-e\ or vitamin B 1 deficiency Nutritional disorder, with nerve and heart impairment, caused by thiamin deficiency. Its name is from the Sinhalese word for "extreme weakness." Symptoms include fatigue, digestive problems, and limb numbness and weakness. Dry beriberi involves gradual long-nerve degeneration, with muscle atrophy and loss of reflexes. Wet beriberi is more acute, with edema from cardiac failure and poor circulation. Thiamin occurs widely in food but is lost in processing; a well-balanced diet high in unprocessed foods can prevent beriberi. In Western countries, chronic alcoholism is the most common cause.

Bering, Vitus (Jonassen) (b. 1681, Horsens, Den. — d. Dec. 19, 1741, Bering Island, near the Kamchatka Peninsula) Danish-born Russian navigator. He joined the fleet of the Russian tsar Peter I and in 1724 was appointed leader of an expedition to determine whether Asia and North America were connected by land. In 1728 he set sail from the Kamchatka Peninsula of Siberia and passed through what would later be named the Bering Strait. His plan for a second expedition was expanded into Russia's Great Northern Expedition (1733 — 43), which mapped much of the Arctic coast of Siberia. After exploring the Alaskan coast, he fell ill from scurvy and died after his ship was wrecked. His exploration paved the way for a Russian foothold in North America.

Bering Sea Marginal sea, North Pacific Ocean. Enclosed by Alaska, the Aleutian Islands, the Kamchatka Peninsula, and eastern Siberia, it covers some 890,000 sq mi (2,304,000 sq km). It has numerous islands, including Karagin and Nunivak, as well as the St. Lawrence, Aleutian, and Komandor archipelagos. It is crossed diagonally by the International Date Line. The sea is connected to the Arctic Ocean by the Bering Strait, which separates Asia from North America and is believed to have been a land

bridge during the Ice Age that enabled migration from Asia to North America. Vitus Bering's exploration of the sea and strait in 1728 and 1741 formed a basis for Russian claims to Alaska.

Bering Sea Dispute Dispute between the U.S. and Britain (and Canada) over the international status of the Bering Sea. In an attempt to control seal hunting off the Alaskan coast, the U.S. in 1881 claimed authority over the Bering Sea and the right to seize sealing vessels. When several Canadian ships were seized in the late 1880s, Britain protested the U.S. claim. An agreement in 1891 permitted both countries to police the area. In 1893 an international tribunal determined that the area was part of the high seas and that no nation had jurisdiction over it.

Berio, Luciano (b. Oct. 24, 1925, Oneglia, Italy — d. May 27, 2003, Rome) Italian composer. He was an important innovator in electronic

music, the combining of live and taped music, aleatory music, graphic notation, musical "collage" using borrowed material, and (perhaps most significantly) in musical "performance pieces." His wife, the singer Cathy Berberian (1925-83), was his principal collaborator. His best-known works include Omaggio a Joyce (1958), Visage (1961), Sinfonia (1968), Opera (1970), and his series of Sequenze (1958-2002).

Berkeley City (pop., 2000: 102,743), west-central California, U.S. Located on San Francisco Bay, the city was founded as Ocean View in 1853 and selected as a campus site by the College (later University) of California. The campus, named for the philosopher George Berkeley, opened in 1873. See also University of California.

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Berkeley, Busby orig. William Berkeley Enos (b. Nov. 29, 1895, Los Angeles, Calif., U.S. — d. March 14, 1976, Palm Springs, Calif.) U.S. film director and choreographer. The son of itinerant actors, he acted and danced in comedies from age five. After choreographing over 20 Broadway musicals, he was summoned to Hollywood to direct dance numbers for Whoopee (1930). His elaborate production numbers, innovative cam-

era techniques, and opulent sets in such films as Gold Diggers of 1933 and Footlight Parade (1933) revolutionized the musical and offered escapist fare for moviegoers during the Great Depression. When rising production costs made such extravaganzas unfeasible, he directed less innovative but still popular films such as The Gang's All Here (1943).

Berkeley Ybark-leV George known as Bishop Berkeley (b.

March 12, 1685, near Dysert Castle, near Thomastown?, County Kilkenny, Ire. — d. Jan. 14, 1753, Oxford, Eng.) Irish bishop, philosopher, and social activist. He worked principally at Trinity College, Dublin (to 1713), and as bishop of Cloyne (1734-52). He is best known for his contention that, for material objects, to be is to be perceived ("Esse est percipi"). His religious calling may have prompted his qualification that, even if no human perceives an object, God does, thereby ensuring the continued existence of the physical world when not perceived by any finite being. With John Locke and David Hume, he was one of the founders of modern empiricism. Unlike Locke, he did not believe that there exists any material substance external to the mind, but rather that objects exist only as collections of sensible ideas. His works include An Essay Towards a New Theory of Vision (1709), Treatise Concerning the Principles of Human Knowledge (1710), and Three Dialogues Between Hylas and Philonous (1713). He spent part of his career in America, where he advocated educating Native Americans and blacks. The city of Berkeley, Calif., U.S., is named for him.

Berkeley, Sir William (b. 1606, Somerset, Eng. — d. July 9, 1677, Twickenham, Middlesex) British colonial governor of Virginia. Appointed governor in 1641, he introduced crop diversification, encouraged manufacturing, and promoted peace with the Indians. A strong monarchist, he was forced to retire to his Virginia plantation during the Commonwealth period in England (1652-59). Reappointed in 1660, he faced crop failures and Indian attacks on the frontier. In 1676 Nathaniel Bacon mounted an expedition against the Indians in defiance of Berkeley's policy of fostering trade. Berkeley fought Bacon for control of the colony, which he eventually regained.

Berkshire Vbark-shorX Geographic county, southern England. It occupies the river valleys of the middle Thames and its tributary, the Kennet, immediately west of London. Settlement of the area dates from the Iron Age, and the Belgic site at Silchester later became a Roman route centre. With the Norman Conquest the Thames valley's strategic importance was recognized, and the first Windsor Castle was built. Windsor and Eton, on Berkshire's eastern boundary, contain the county's most noted structures. With its seat at Reading, it was an administrative county from 1974 to 1998.

Berkshire Hills Segment of the Appalachian Mtns., western Massachusetts. Many of its summits exceed 2,000 ft (600 m), including Mount Greylock (3,491 ft, or 1,064 m), the highest point in the state. The wooded hills are a continuation of the Green Mtns. of Vermont; they include the Hoosac and Taconic ranges. Crossed by the Appalachian National Scenic Trail, the Berkshires contain state parks and forests and are the home of the Tanglewood summer music festival (in Lenox).

Berlage Vber-lak-oV, Hendrik Petrus (b. Feb. 21, 1856, Amsterdam, Neth. — d. Aug. 12, 1934, The Hague) Dutch architect. After studies in Zurich, he began his practice in Amsterdam (1889). His best-known work

is the Amsterdam Stock Exchange (1897-1903), notable for its forthright use of structural steel and traditional Dutch brickwork. While visiting the U.S. (1911), he was exposed to the work of Louis H. Sullivan and Frank Lloyd Wright and later introduced their methods and ideas to Europe. His work was characterized by the honest use of materials based on their fundamental properties and the avoidance of meaningless ornamentation.

Berle VbsrlV, Milton orig. Milton Berlinger (b. July 12, 1908, New York, N.Y., U.S. — d. March 27, 2002, Los Angeles, Calif.) U.S. comedian. He appeared in vaudeville from age 10 and later acted in more than 50 silent films. He worked chiefly as a nightclub comedian (1939-49) while vainly seeking a radio audience. His slapstick routines and facial contortions, however, were more suited to a visual medium, and between 1937 and 1968 he appeared in 19 movies. His greatest success came with

the television variety show Texaco Star Theater (1948-54), a show so popular that many people are said to have bought television sets just to watch “Uncle Miltie.”

Berlin City and state (pop., 2002 est: city, 3,388,000; metro, area, 4,101,000), capital of Germany. Founded in the early 13th century, it was a member of the Hanseatic League in the 14th century. It became the residence of the Hohenzollerns and the capital of Brandenburg. It was successively the capital of Prussia (from 1701), the German Empire (1871-1918), the Weimar Republic (1919—32), and the Third Reich (1933^15). In World War II much of the city was destroyed by Allied bombing. In 1945 it was divided into four occupation zones: U.S., British, French, and Soviet. The three Western powers integrated their sectors into one economic entity in 1948; the Soviets responded with the Berlin blockade. When independent governments were established in eastern and western Germany in 1949, East Berlin was made the capital of East Germany, and West Berlin, though surrounded by East Germany, became part of West Germany. Continuing immigration from East to West Berlin through the 1950s prompted the 1961 erection of the Berlin Wall. The area immediately became the most vivid focal point of the Cold War. The dramatic dismantling of the wall in 1989 marked the international upheaval that accompanied the end of the Soviet Union. Berlin became reunified as Germany’s official capital in 1991; the transfer of government from Bonn was completed in 1999. It is the site of the University of Berlin, Charlottenburg Palace, Brandenburg Gate, and Berlin Zoo and is home to the Berlin Opera and Berlin Philharmonic Orchestra.

Berlin, Congress of (June 13-July 13, 1878) Diplomatic meeting of the major European powers at which the Treaty of Berlin replaced the Treaty of San Stefano. Dominated by Otto von Bismarck, the congress solved an international crisis by revising the peace settlement to satisfy the interests of Britain and Austria-Hungary. By humiliating Russia and failing to acknowledge adequately the aspirations of the Balkan peoples, it laid the foundation for future Balkan crises.

Berlin, Irving orig. Israel Baline (b. May 11, 1888, Mogilyov, Russia — d. Sept. 22, 1989, New York, N.Y., U.S.) U.S. songwriter. The son of a Russian Jewish cantor, he and his family immigrated to New York City in 1893. He worked as a street singer and singing waiter, then began writing songs. His first published song, “Marie from Sunny Italy,” appeared in 1907; a printer’s error named him Irving Berlin. In 1911 he wrote the great hit of Tin Pan Alley’s ragtime vogue, “Alexander’s Ragtime

Band." He may have written more than 1,500 songs. Some of his songs include "Cheek to Cheek" and "God Bless America." He scored many successful films; his score for Holiday Inn (1942) introduced "White Christmas," one of the best-selling songs of all time. Altogether Berlin wrote the scores for 19 Broadway shows (including Annie Get Your Gun, 1946) and 18 films.

Berlin, Sir Isaiah (b. June 9, 1909, Riga, Latvia — d. Nov. 5, 1997, Oxford, Eng.) Latvian-born British political philosopher and historian of ideas. His family immigrated to Britain in 1920. Educated at the University of Oxford, Berlin taught there from 1950 to 1967, serving as president of Wolfson College from 1966 to 1975 and thereafter teaching at All Souls College. His writings on political philosophy are chiefly concerned with the problem of free will in increasingly totalitarian and mechanistic societies. His most important works include Karl Marx (1939), The Hedgehog and the Fox (1953), Historical Inevitability (1955), The Age of Enlightenment (1956), and Four Essays on Liberty (1969).

Berlin, University of or Humboldt University of Berlin Public university in Berlin, Germany. It was founded (as Friedrich Wilhelm University) in 1809-10 by Wilhelm, baron von Humboldt. By the mid 1800s it had attained world renown for its modern curriculum and its scientific research institutes. Among its faculty were G.W.F. Hegel, Johann Gottlieb Fichte, Arthur Schopenhauer, Leopold von Ranke, Hermann von Helmholtz, Friedrich Schleiermacher, and Jacob and Wilhelm Grimm. In the 1930s it was Nazified, and many of its faculty fled abroad. Under the German Democratic Republic after World War II, it was renamed Humboldt University and given a Marxist-Leninist orientation. It was reorganized after East and West Germany reunified in 1990.

Berlin blockade and airlift (1948^-9) International crises that arose from an attempt by the Soviet Union to force the Allied powers (U.S., Britain, and France) to abandon their postwar jurisdictions in West Berlin. The Soviets, regarding the economic consolidation of the three Allied occupation zones in Germany in 1948 as a threat to the East German

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economy, blockaded all transportation routes between Berlin and West Germany. The U.S. and Britain responded by supplying the city with food and other supplies by military air transport and airlifting out West Berlin exports. An Allied embargo on exports from the Eastern bloc forced the Soviets to lift the blockade after 11 months.

Berlin Painter (fl. 500^160 bc, Athens, Greece) Greek vase painter, the outstanding vase painter of the late Archaic period. He is best known as the decorator of an amphora now in Berlin. Whereas it had been customary to frame the groups of figures on each side of the vase with pattern bands, the Berlin Painter eliminated the frame, allowing the figures to dominate and stand out sharply against the black background. Nearly 300 vases are attributed to him.

Berlin Wall Barrier surrounding West Berlin that closed off East Germans access to West Berlin from 1961 to 1989 and served as a symbol of the Cold War's division of East and West Germany. The barrier was built in response to the flight of about 2.5 million East Germans to West Germany in the years 1949-61. First erected on the night of Aug. 12-13, 1961, it developed into a system of concrete walls topped with barbed wire and guarded with watchtowers, gun emplacements, and mines. It was opened in the 1989 democratization that swept through eastern Europe and has been largely torn down.

Berlin West Africa Conference (1884-85) Series of negotiations at Berlin in which the major European nations met to determine the future of Central Africa. The participants declared the Congo River basin region to be neutral, guaranteed freedom of trade and shipping for all colonial powers, forbade slave trading, and rejected Portugal's claims to the region.

Berlinguer V.ber-lin-'gwerV Enrico (b. May 25, 1922, Sassari, Sardinia, Italy — d. June 11, 1984, Padua) Italian politician. Born into a middle-class Sardinian family, he joined the Communist Party in 1943 and held a series of party posts before becoming secretary-general in 1972, a post he would keep until his death. He became a leading advocate of "national communism," seeking independence from Moscow and favouring the adaptation of Marxism to local requirements. His proposal for a coalition government of Christian Democrats and communists was never realized.

Berlioz Vber-le-.ozX, (Louis-) Hector (b. Dec. 11, 1803, La Cote-Saint- Andre, France — d. March 8, 1869, Paris) French composer. He studied guitar in his early years and later studied music at the Paris Conservatoire, against his parents' wishes. His first great score was the stormy Symphonie fantastique (1830), which became a landmark of the Romantic era. Impulsive and passionate, he was a contentious critic and gadfly constantly at war with the musical establishment. Though he was the most compelling French musical figure of his time, his idiosyncratic compositional style kept almost all his music out of the repertory until the mid-20th century. His works include the operas Benvenuto Cellini (1837) and Les Troyens (1858); the program symphonies Harold in Italy (1834) and Romeo and Juliet (1839); and the choral dramas La Damnation de Faust (1846) and L'Enfance du Christ (1854). He was also known as a brilliant conductor with an unsurpassed knowledge of the orchestra; his orchestration treatise (1843) is the most influential such work ever written.

Berlusconi, Silvio (b. Sept. 29, 1936, Milan, Italy) Italian media tycoon and prime minister in 1994 and again from 2001. After graduating from the University of Milan, he became a real estate developer, amassing a considerable fortune by the 1970s. By the 1990s he owned more than 150 businesses, including three television networks and Italy's largest publishing house. In 1994 he founded Forza Italia, a conservative political party, and was elected prime minister. Faced with conflict of interest and other charges, he resigned in December 1994. He was later convicted of fraud and corruption, though he was acquitted of tax evasion. Despite the convictions and criticism of his control of much of the Italian media, he remained the leader of Forza Italia and again became prime minister in 2001.

Bermejo \ber-'ma-ho\, Bartolome or Bartolome de Cardenas

Vkar-da-nas\ (b. c. 1440, Cordoba, Spain — d. 1495, Barcelona) Spanish painter. He was active in Valencia (1468), Aragon (1474-85), and Barcelona (from 1486). Bermejo' s earliest masterpiece is the panel painting Santo Domingo de Silos (1474). His Pieta (1490) in Barcelona Cathedral is considered a masterpiece of early Spanish oil painting; the influence of

Rogier van der Weyden can be seen in the rich detail and colour. Bermejo cultivated the Flemish style and was considered the most outstanding painter in Spain before El Greco.

Bermejo \ber-'ma-ho\ River River, northern Argentina. Rising on the Bolivian frontier, it flows southeast 650 mi (1,045 km) into the Paraguay River on the border of Paraguay and Argentina. The abundant silt it carries in suspension is the source of its name (bermejo , "reddish"). It is navigable for small craft along its central course, known as the Teuco River.

Bermuda British overseas territory (pop., 2005 est.: 65,400), western Atlantic Ocean. Comprising 7 main islands and about 170 additional (named) islets and rocks, it lies about 570 mi (920 km) southeast of Cape Hatteras, N.C., U.S. The archipelago has a total land area of about 20.5 sq mi (53 sq km). The capital is Hamilton on Main Island. Bermuda was named for Juan de Bermudez, who may have visited the islands in 1503. Colonized by the English in 1612, Bermuda became a crown colony in 1684, and its status changed to an overseas territory in 2002. Its economy is based on tourism and international finance; its gross national product per capita is among the world's highest.

Bermuda Triangle Triangular section of the North Atlantic Ocean whose boundaries are usually said to be Bermuda, the southern U.S. coast, and the Greater Antilles. The region attracted international attention after numerous planes and ships were said to have mysteriously disappeared there. Reports of unnatural occurrences were popularized, but by the late 20th century much of the myth surrounding the Bermuda Triangle had been dispelled.

Bern City (pop., 2000 est: city, 128,600; metro, area, 317,300), capital of Switzerland. Lying along a loop of the Aare River, it was founded as a military post in 1191 by Berthold V, duke of Zahringen. It became a free imperial city in 1218. Gradually extending its power, it became an independent state, and in 1353 it entered the Swiss Confederation. It was a scene of disputation in 1528 between Roman Catholics and reformers, which led to its subsequent championing of Protestant doctrines. It became a member of the Helvetic Republic and in 1848 was made the capital of Switzerland. It is headquarters of the international postal, railway, and copyright unions.

Bern Convention officially International Convention for the Protection of Literary and Artistic Works International agreement adopted in Bern, Switz., in 1886 to protect copyrights on an international basis. It was modified several times throughout the 20th century. Its signatories constitute the Bern Copyright Union. Each member country grants the authors of other member countries the same rights that its laws grant its own nationals. Protected works include every kind of literary, scientific, and artistic production, regardless of mode of expression,

including paintings, sculptures, architectural plans, and musical arrangements. Copyright is now protected for 70 years after the creator’s death.

Bernadette of Lourdes, Saint orig. Marie-Bernarde Soubir-

ous (b. Jan. 7, 1844, Lourdes, France — d. April 16, 1879, Nevers; canonized Dec. 8, 1933; feast day April 16, but sometimes February 18 in France) French visionary. The daughter of a miller, she had a poverty-stricken childhood and was often ill. In 1858 she had a series of visions of Mary; she defended their authenticity against the doubts of her parents, the clergy, and civil authorities. She joined the Sisters of Charity at Nevers (1866) and remained in seclusion until her death at 35. The grotto at Lourdes became a pilgrimage site; its waters are reputed to have healing powers.

Bernadotte \ber-na-'dot\ (af Wisborg), Folke, Count (b. Jan. 2, 1895, Stockholm, Swed. — d. Sept. 17, 1948, Jerusalem) Swedish soldier, humanitarian, and diplomat. A nephew of King Gustav V, Bernadotte headed the Swedish Red Cross in World War II and was credited with saving some 20,000 concentration-camp inmates. In 1948 he was appointed mediator in Palestine by the UN Security Council and secured a cease-fire between Israel and the Arab states. He made enemies by proposing that Arab refugees be allowed to return to their homes in what had become Israel and was assassinated by Jewish extremists.

Bernanos \ber-na-'nos\, Georges (b. Feb. 20, 1888, Paris, France — d. July 5, 1948, Neuilly-sur-Seine) French novelist and polemical writer. One of the most original and independent Roman Catholic writers of his time and a man of humour and humanity, he abhorred materialism and compromise with evil. His masterpiece. The Diary of a Country Priest (1936), is

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the story of a young priest’s war against sin. Dialogues of the Carmelites (1949), a screenplay about 16 nuns martyred during the French Revolution, was the basis for an opera by Francis Poulenc (1957).

Bernard \ber-'nar\, Claude (b. July 12, 1813, Saint-Julien, France — d. Feb. 10, 1878, Paris) French physiologist. He taught at several major French institutions and was named a senator in 1869. He discovered the role of the pancreas in digestion, the glycogenic function of the liver in carbohydrate metabolism, and blood-supply regulation by the vasomotor nerves. He helped establish the principles of experimentation in the life sciences, including the need for a hypothesis. His concept of the internal environment of the organism led to the present understanding of homeostasis. Bernard also studied the effects of such poisons as carbon monoxide and curare. He was awarded the grand prize in physiology three times by the Academie des Sciences.

Bernard de Clairvaux \kler-'vo\, Saint (b. 1090, probably

Fontaine-les-Dijons, near Dijon, Burgundy — d. Aug. 20, 1153, Clairvaux, Champagne; canonized 1174; feast day August 20) French Cistercian monk, mystic, and doctor of the church. Born into an aristocratic family near Dijon, he turned away from a literary education for the monastic life, entering the austere religious community at Citeaux in 1112. As abbot of the Cistercian monastery at Clairvaux, Champagne, which he founded in 1 1 15, he helped establish the widespread popularity of the order. Between 1 130 and 1145 he mediated civil and ecclesiastical councils and theological debates, and his support for Pope Innocent II helped secure the papacy during the schism with Anacletus. Bernard was the confidant of five popes and became perhaps the most renowned religious figure in Europe. He actively preached the Second Crusade and wrote a number of sermons on the Song of Solomon. He opposed the teachings of Peter Abelard and Henry of Lausanne and defended devotion to the Virgin Mary.

Bernardine See Cistercian

Bernardine Vbor-nor-denX of Siena, Saint (b. Sept. 8, 1380, Massa Marittima, Siena — d. May 20, 1444, L’ Aquila, Kingdom of the Two Sicilies; canonized 1450; feast day May 20) Franciscan priest and theologian. Born into a noble family but orphaned early, he entered the Observants (1402), a strict branch of the Franciscan order that he later helped to spread throughout Europe. In 1417 he began preaching tours in Italy, seeking to combat the lawlessness, strife, and immorality resulting from the Western Schism. Through the Council of Florence he worked to unite the Greek and Roman churches. Numerous miracles are said to have occurred at his tomb.

Bernays, Edward L. (b. Nov. 22, 1891, Vienna, Austria — d. March 9, 1995, Cambridge, Mass., U.S.) U.S. publicist, the “father of public relations.” A nephew of Sigmund Freud, he was born in Austria but was brought up in New York. In organizing endorsements for a play on the taboo subject of venereal disease, he found his calling as a publicist. His early clients included the U.S. War Department and the Lithuanian government. He edited The Engineering of Consent (1955), whose title is his often-quoted definition of public relations. He died at the age of 103.

Berners-Lee, Tim (b. June 8, 1955, London, Eng.) British physicist. The son of computer scientists, he graduated from Oxford University and in 1980 accepted a fellowship at CERN in Geneva. In 1989 he suggested a global hypertext project. He and his CERN colleagues created a communications protocol called HyperText Transfer Protocol (HTTP) that standardized communication between computer servers and clients. Their text-based Web browser was released to the public in 1991, marking the beginnings of the World Wide Web and general public use of the Internet. He declined all opportunities to profit from his immensely valuable innovation. In 1994 he joined MIT’s Laboratory for Computer Science as director of the World Wide Web Consortium.

Bernese Alps German Berner Oberland X.bor-nor-'o-bor-.lanA Segment of the Alps, Switzerland. It lies north of the Rhone River and south of Brienzer and Thuner lakes and extends east from Martigny-Ville to Grimsel Pass and the valley of the upper Aare River. Many peaks, including the Finsteraarhorn, Jungfrau, and Aletschhorn, rise more than 12,000 ft (3,660 m). The Bernese Alps are crossed by the Lotschen, Gemmi, and Pillon passes and the Lotschberg railway tunnel. Many resorts, including Interlaken, Grindelwald, and Gstaad, dot the area.

Bernese mountain dog Breed of Swiss working dog brought to Switzerland over 2,000 years ago by invading Romans. The hardy breed was widely used to pull carts and to drive cattle to and from their pas-

tures. It has a broad chest, hanging V-shaped ears, and a long, silky, black coat. Markings include brown spots on the chest and forelegs and over the eyes, and sometimes white on the chest, nose, feet, and tail tip. The breed stands 21-28 in. (53-70 cm) high and weighs about 90 lbs (40 kg).

Bernhard \'bern- l hart\ (b. June 29, 1911, Jena, Ger. — d. Dec. 1, 2004, Utrecht, Neth.) Prince of The Netherlands. The son of Prince Bernhard Casimir of Lippe-Biesterfeld, Bernhard married the Dutch crown princess Juliana in 1937 and took Dutch citizenship. He opposed Germany's invasion of The Netherlands and took his family to Britain after the Dutch surrender (1940). In World War II he served as the Dutch liaison with the British armed forces, flew with the Royal Air Force (1942^44), and led Dutch troops in the Allied offensive in The Netherlands (1945). After the war and Juliana's accession as queen (1948-80), he became The Netherlands' goodwill ambassador. He was active in conservation efforts and in 1961 helped found the World Wildlife Fund. In 1976 he was implicated in a bribery scandal that temporarily tarnished the monarchy.

Bernhardi Vbern-.har-deV, Friedrich von (b. 1849, Estonia, Russian Empire — d. 1930) German soldier and military writer. He fought in the Franco-Prussian War and became commander of the Seventh Army corps in 1909. In 1911 he published Germany and the Next War, arguing that Germany had a right and responsibility to wage war to gain the power it deserved. The Allies later considered his book a contributing cause of World War I, in which Bernhardi served as a corps commander.

Bernhardt \ber-'nar,\ English Ybom-JiartV Sarah orig. Henriette-Rosine Bernard (b. Oct. 22/23,

1844, Paris, France— d. March 26,

1923, Paris) French actress. The illegitimate child of a courtesan, she was encouraged to pursue a theatrical career by one of her mother's lovers, the duke de Morny. After a brief appearance at the Comedie-Francaise (1862-63), she joined the Odeon theatre (1866-72), where she acted in Kean by Alexandre Dumas pere and Ruy Bias by Victor Hugo, charming audiences with her "golden voice." Returning to the Comedie-Fran^aise (1872-80), she starred in Phedre to great acclaim in Paris and London. She formed her own company in 1880 and toured the world in The Lady of the Camellias by Alexandre Dumas fils, Adrienne Lecouvreur by Eugene Scribe, four plays written for her by Victorien Sardou, and The Eaglet by Edmond Rostand. After an injury to her leg forced its amputation (1915), she strapped on a wooden leg and chose

roles she could play largely seated. One of the best-known figures in the history of the stage, she was made a member of France’s Legion of Honour in 1914.

Bernicia \ber-'ni-sh3\ Ancient northern Anglo-Saxon kingdom. It stretched northward from perhaps as far south as the River Tees, ultimately reaching the Firth of Forth. By the end of the 7th century ad it had united with its neighbour Deira to form the kingdom of Northumbria. It had a royal residence at coastal Bamburgh. The first recorded king, Ida, was crowned there in 547; his grandson Aethelfrith (r. 593-616) united Bernicia and Deira.

Bernini, Gian Lorenzo (b. Dec. 7, 1598, Naples, Kingdom of Naples — d. Nov. 28, 1680, Rome, Papal States) Italian architect and artist credited with creating the Baroque style of sculpture. He began his career working for his father, a sculptor. Among his early sculptures are Apollo and Daphne (1622-24) and an active David (1623-24). Under the patronage of Urban VIII, the first of eight popes he was to serve, he created the baldachin over the tomb of St. Peter in Rome. Bernini’s architectural duties increased after 1629, when he was appointed architect of St. Peter's Basilica and the Palazzo Barberini. His works often represent a fusion of architecture and sculpture, as in the Comaro Chapel, in Santa Maria della Vittoria, Rome, with its celebrated theatrical sculpture, The Ecstasy of St. Teresa (1645-52). His greatest architectural achievement is the colonnade enclosing the piazza before St. Peter’s. Among his many

Sarah Bernhardt, photograph by Napoleon Sarony, 1 880.

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other contributions to Rome are his Triton Fountain and Fountain of the Four Rivers, noted for their architectural composition and detail.

Bernoulli \ber-'nu-le\ family Two generations of distinguished Swiss mathematicians. Jakob (1655—

1705) and Johann (1667-1748) were the sons of a pharmacist who wanted one boy to study theology and the other medicine. Over his objections, both pursued careers in mathematics, making important discoveries in cal-

culus, the calculus of variations, and differential equations. They sometimes worked together, but not without friction. Johann’s son Daniel (1700-82) made important contributions to fluid dynamics (see Bernoulli's PRINCIPLE) and PROBABILITY THEORY.

Widely admired throughout Europe, he also studied and lectured on medicine, physics, astronomy, and botany.

Bernoulli's principle or Bernoulli's theorem Principle that relates pressure, velocity, and height for a nonviscous fluid with steady flow. A consequence is that, for horizontal flow, as the speed of a fluid increases, the pressure it exerts decreases. Derived by Daniel Bernoulli (see Bernoulli family), the principle explains the lift of an airplane in motion. As the speed of the plane increases, air flows faster over the curved top of the wing than underneath. The upward pressure exerted by the air under the wing is thus greater than the pressure exerted downward above the wing, resulting in a net upward force, or lift. Race cars use the principle to keep their wheels pressed to the ground as they accelerate. A race car’s spoiler — shaped like an upside-down wing, with the curved surface at the bottom — produces a net downward force.

Bernstein Vbem-shtlnV Eduard (b. Jan. 6, 1850, Berlin, Prussia — d. Dec. 18, 1932, Berlin, Germany) German politician and writer. He joined the German Social Democratic Party in 1872, then spent years in exile as an editor of socialist journals. In London he met Friedrich Engels and was influenced by the Fabian Society. Returning to Germany in 1901, Bernstein became the political theorist of the revisionists and was one of the first socialists to modify such Marxist tenets as the imminent collapse of capitalism. He envisaged a type of social democracy that combined private initiative with social reform. As a member of the Reichstag (1902-06, 1912-16, 1920-28), he inspired much of the reformist programs of the Social Democrats.

Apollo and Daphne , marble sculpture by Gian Lorenzo Bernini, 1622-24; in the Borghese Gallery, Rome.

SCALA/ART RESOURCE, NEW YORK

Bernstein, Leonard (b. Aug. 25, 1918, Lawrence, Mass., U.S. — d. Oct. 14, 1990, New York, N.Y.) U.S. conductor, composer, and writer. He resolved on a music career only after graduating from Harvard University.

He studied conducting at the Curtis Institute of Music with Fritz Reiner and then at Tanglewood (in Lenox,

Mass.), where he met Aaron Copland and became Serge Koussevitzky's assistant. Fame came abruptly in 1943 when he substituted on short notice for the conductor of the New York Philharmonic orchestra and was praised for his technical self-assurance and interpretive excellence. In 1944 he triumphed with his music for Jerome Robbins's ballet Fancy Free and the Broadway show On the Town. As a composer he made use of diverse elements ranging from biblical themes to jazz rhythms. His best-known composition was the score for the hit musical West Side Story (1957); other works include the musicals Wonderful Town (1952) and Candide (1956), three symphonies, the Chichester Psalms (1965), and the theatrical Mass (1971). Well known as a television lecturer, he was also a prominent political activist.

Leonard Bernstein.

LAUTERWASSER, COURTESY DEUTSCHE GRAMMOPHON

Bernstorff Vbem-shtorfV, Johann-Heinrich, count von (b. Nov. 14, 1862, London, Eng. — d. Oct. 6, 1939, Geneva, Switz.) German diplomat. After entering the diplomatic service (1899), he represented Germany in London and Cairo before serving as ambassador to the U.S. (1908-17). During World War I he worked to facilitate mediation of the conflict with Woodrow Wilson but did not receive the support he expected from authorities in Berlin. He served as chairman of the German League of Nations Union until 1933, when he went into exile in Geneva.

Berra Vber-oX, Yogi orig. Lawrence Peter Berra (b. May 12, 1925, St. Louis, Mo., U.S.) U.S. baseball player, manager, and coach. Berra joined the New York Yankees in 1946 and served as the team's regular catcher from 1949 until his retirement in 1963. He was named the American League's Most Valuable Player in 1951, 1954, and 1955. He caught in more World Series games (75) than any other catcher and hit 20 or more home runs a season through 1958. He managed the Yankees in 1964 but was fired and became a coach and manager (1965-75) with the New York Mets. He returned to the Yankees as a coach (1976-82) and later manager (1983-85). He was known for idiosyncratic remarks such as "It ain't over till it's over" and "It's deja vu all over again." The American cartoon character Yogi Bear was named for him.

Berrigan, Daniel (Joseph) and Philip (Francis) (respectively b. May 9, 1921, Virginia, Minn., U.S.(b. Oct. 5, 1923, Two Harbors, Minn., U.S.) — d. Dec. 6, 2002, Baltimore, Md.) U.S. priests and political activists. After joining the Catholic priesthood (Daniel became a Jesuit, Philip a Josephite), the brothers became involved in nonviolent political activism, carrying out campaigns of civil disobedience to oppose racism, the nuclear arms race, and the Vietnam War. They were best known for their Vietnam-era raid of draft-board files in Catonsville, Md., which they destroyed with chicken blood and napalm. They were also known for the persistence of their activism. Philip later left the priesthood. Both authored numerous books on their work and beliefs; Daniel also wrote poetry and

plays.

Berruguete, Alonso (b. c. 1488, Paredes de Nava, Castile — d. 1561, Toledo, Castile) Spanish sculptor and painter. His father, Pedro Berruguete, was a great Renaissance painter. Alonso worked in Florence and Rome c. 1508-16. In 1516 he returned to Spain, and in 1518 he became court painter to Charles V. He succeeded primarily as a sculptor, however, and became known for his intensely emotional Mannerist sculptures of figures portrayed in spiritual torment or in transports of religious ecstasy. His best-known work is a set of wooden reliefs with highly expressive figures for choir stalls in Toledo Cathedral (1539-43). Berruguete' s use of a rather rich and extravagant but delicate ornamentation in his church decorations is typical of Spain's Plateresque style. He is considered the greatest Spanish sculptor of the 16th century.

Berruguete \,ber-u-'ga-ta\, Pedro or Pedro Espanol or Pietro Spagnuolo X.span-yo-'wo-loX (b. c. 1450, Paredes de Nava, Castile — d. Jan. 6, 1504, Avila, Castile) Spanish painter. After a sojourn in Italy, he returned to Spain, where he painted numerous altarpieces and also worked as a fresco painter in Toledo Cathedral (1483-99). The influence of Flemish and Italian art is evident in his panel paintings, which are characterized by luxurious ornament and gold decoration. He was the first great Renaissance painter in Spain. His son Alonso Berruguete was a sculptor and painter.

Berry \be-'re\ Historical region and former province, central France. It was originally inhabited by the Bituriges Cubi, who opposed Vercingetorix. Under Roman rule it was part of Aquitania Prima. A countship in the Carolingian period, it fell to the French crown in the 12th century. When Aquitaine was acquired by Henry II of England, Berry became a matter of dispute between England and France. As a duchy, at one time it came under Jean de France, duke de Berry, an important patron of the arts. It returned to France in 1601 and remained a province until 1790.

berry Simple, fleshy fruit that usually has many seeds (e.g., the banana, tomato, or cranberry). The middle and inner layers of the fruit wall often are not distinct from each other. Any small, fleshy fruit is popularly called a berry, especially if it is edible. Raspberries, blackberries, and strawberries are not true berries, but rather aggregate fruits — fruits that consist of multiple smaller fruits. The date is a one-seeded berry whose stone is hard nutritive tissue.

Berry, Chuck orig. Charles Edward Anderson Berry (b. Oct. 18, 1926, St. Louis, Mo., U.S.) U.S. singer-songwriter. Though first

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interested in country music, in the early 1950s Berry led a blues trio that

played in black nightclubs around St. Louis. In 1955 he traveled to Chicago and made his first hit record, “Maybellene,” which was soon followed by “Sweet Little Sixteen,” “Johnny B. Goode,” “Rock and Roll Music,” and “Roll Over, Beethoven.” He was one of the first to shape big-beat blues into what came to be called rock and roll (see rock music) and to achieve widespread popularity with white audiences. After two trials tainted by racist overtones, in 1959 he began a five-year prison sentence for immoral behaviour. In 1972 he achieved his first number one hit, “My Ding-A-Ling.” He continued to perform into the 1990s. The Beatles and the Rolling Stones were among the many rock bands greatly influenced by Berry.

Berry, Jean de France, duke de (b. Nov. 30, 1340, Vincennes, France — d. June 15, 1416, Paris) French nobleman and patron of the arts. He was the son of King John II. As duke de Berry and Auvergne, he controlled at least one-third of France during the middle period of the Hundred Years' War. Berry shared in the administration of France and worked for peace with England and within France, acting as diplomat and mediator. He invested fortunes in the art treasures that became his monument — paintings, tapestries, jewelry, and illuminated manuscripts that included the famous Tres Riches Heures du due de Berry.

Berry \be-'re\, Jean de France, duke de orig. Charles-Ferdinand de Bourbon (b. Jan. 24, 1778, Versailles, France — d. Feb. 14, 1820, Paris) French nobleman. Son of the future Charles X, he left France at the outbreak of the French Revolution and lived abroad until 1815. His assassination by a Bonapartist fanatic marked a turning point in the Bourbon Restoration, hastening the downfall of the moderate Decazes government and the polarization into liberal and royalist groups.

berserker (from Old Norse beserkr, “bearskin”) In premedieval and medieval Norse and Germanic history and folklore, any member of unruly warrior gangs that worshiped Odin and attached themselves to royal and noble courts as bodyguards and shock troops. They raped and murdered at will in their host communities, and their savagery in battle and animal-skin attire (they are also said to have fought naked) contributed to the development of the werewolf legend in Europe.

Bert \'ber\, Paul (b. Oct. 17, 1833, Auxerre, Yonne, France — d. Nov. 11, 1886, Hanoi) French physiologist, founder of modern aerospace medicine. He taught for many years at the Sorbonne and served as a deputy in the government from 1872-86. His research on the effects of air pressure on the body helped make possible the exploration of space and the ocean depths. Bert found the main cause of altitude sickness to be low atmospheric oxygen content and showed decompression sickness to be due to nitrogen bubbles formed in the blood during rapid drops in external pressure.

Bertelsmann AG German media company. Beginning as a religious printer and publisher in 1835, the company grew steadily over the next century. Though virtually destroyed by Allied bombing in 1945, it recovered quickly after World War II. By 1998 Bertelsmann AG had grown to include more than 300 media companies, with more than half its employees in countries other than Germany. Its worldwide acquisitions have included the U.S. publishers Bantam Doubleday Dell and Random House.

By the early 21st century the company was among the world's largest media conglomerates.

Berthelot \ber-t3-'lo\, (Pierre-Eugene-) Marcellin (b. Oct. 27, 1827, Paris, France — d. March 18, 1907, Paris) French chemist. The first professor of organic chemistry at the College de France (from 1865), he later also held high government offices, including that of foreign minister (1895-96). He did research in alcohols and carboxylic acids, the synthesis of hydrocarbons, and reaction rates, studied the mechanism of explosion, discovered many coal-tar derivatives, and wrote on the history of early chemistry. He was a pioneer in the use of chemical analysis as a tool of archaeology. His work helped break down the traditional division between organic and inorganic compounds. He opposed the then-current idea that a "vital force" is responsible for synthesis and was one of the first to prove that all chemical phenomena depend on physical forces that can be measured.

Berthoud \ber-'tu\, Ferdinand (b. March 19, 1727, Plancemont, Switz. — d. June 20, 1807, Groslay, France) Swiss-French clockmaker and writer on timekeeping. Working in Paris from 1748, his inventiveness and many publications soon made him influential. His interest in the problem of determining longitude at sea (see latitude and longitude) led to his major achievement, an improved, less expensive marine chronometer. Berthoud's improvements were retained in modern instruments. See also John Harrison.

Bertoia Xbor-'toi-oX, Harry (b. March 10, 1915, San Lorenzo, Italy — d. Nov. 6, 1978, Barto, Pa., U.S.)

Italian-bom U.S. sculptor and designer. He attended the Cranbrook Academy of Art and later taught there (1937^13). He worked in California with designer Charles Eames before joining Knoll Associates in New York City in 1950. His achievements there included the Diamond Chair (commonly known as the Bertoia chair), made of polished steel wire and covered with elastic Naugahyde upholstery. He also produced "sound sculptures" that were activated by the wind and numerous works for corporations and public spaces.

Bertolucci \ 1 ber-t3-'lii-che\ / Bernardo (b. March 16, 1940, Parma,

Italy) Italian film director. After writing poetry and an award-winning book, he entered filmmaking as an assistant to Pier Paolo Pasolini in 1961. His first films as a director, The Grim Reaper (1962) and Before the Revolution (1964), were followed by the well-received The Conformist (1970). The erotic Last Tango in Paris (1972) made him an international and commercial sensation. He later directed such films as 1900 (1976), The Last Emperor (1987, Academy Awards for direction and best film), and Stealing Beauty (1996).

beryl Vber-aL Mineral composed of beryllium aluminum silicate, Be 3 Al 2 (Si0 3) 6 , a commercial source of beryllium. Several varieties are valued as gemstones: aquamarine (pale blue-green); emerald (deep green); heliodor (golden yellow); and morganite (pink). Before 1925 beryl was used only as a gemstone, but since then many important uses have been found for beryllium (e.g., in nuclear reactors, space vehicles, and X-ray tubes). No large deposits have been found, and most production is a by-product of the mining of feldspar and mica. Brazil is a major producer; others include Zimbabwe, South Africa, Namibia, and the U.S.

beryllium Vbo-'ril-e-omV Chemical element, lightest of the alkaline earth metals, chemical symbol Be, atomic number 4. It does not occur uncombined in nature but is found chiefly as the mineral beryl (of which emerald and aquamarine are gemstone varieties). Beryllium metal, particularly in alloys, has many structural and thermal applications; it is used in nuclear reactors. Beryllium has valence 2 in all its compounds, which are generally colourless and taste distinctly sweet. All soluble beryllium compounds are toxic. Beryllium oxide is used in specialized ceramics for nuclear devices, and beryllium chloride is a catalyst for organic reactions.

The Diamond chair designed by Harry Bertoia, 1 952

COURTESY OF THE KNOLL GROUP

Berryman, John (b. Oct. 25, 1914, McAlester, Okla., U.S. — d. Jan. 7, 1972, Minneapolis, Minn.) U.S. poet. Berryman attended Columbia University and the University of Cambridge and later taught at various universities. Homage to Mistress Bradstreet (1956), one of his first experimental poems, assured his importance. His technical daring was also evident in 77 Dream Songs (1964, Pulitzer Prize), augmented to form a sequence of 385 “Dream Songs” in His Toy, His Dream, His Rest (1968). Later works include the deceptively offhand Love & Fame (1970) and Recovery (1973), an account of his struggle against alcoholism. He is noted for his confessional poetry laced with humour.

Subject to deep depression, he committed suicide by jumping from a Berryman bridge . courtesy of the university of Minnesota

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Berzelius Xber-'sa-le-osX, Jons Jacob, Baron (b. Aug. 20, 1779, near Linkoping, Swed. — d. Aug. 7, 1848, Stockholm) Swedish chemist. As a professor in Stockholm (1807-32) he achieved an immensely important series of innovations and discoveries. He is especially noted for his introduction of basic laboratory equipment that remains in use today; his determination of atomic weights; his creation of the modern system of chemical symbols; his theory of electrochemistry; his discovery of the elements cerium, selenium, and thorium and his isolation of silicon, zirconium, and titanium; his contribution to the classical techniques of analysis; and his investigations of isomerism and catalysis, both of which he named. He published more than 250 original research papers. He is regarded as one of the founders of modem chemistry.

Bes Minor Egyptian god with a grotesque appearance. His figure was intended to inspire joy or drive away pain and sorrow, and his ugliness was probably thought to frighten off evil spirits. He was associated with music and childbirth. The name Bes is now used to designate a group of deities of similar appearance with various ancient names.

Jons Jacob Berzelius, detail of an oil painting by Olof Johan Sodermark,

1 843; in the Royal Swedish Academy of Sciences, Stockholm.

COURTESY OF SVENSKA PORTRATTARKIVET, STOCKHOLM

Bes represented as a dwarf, statue; in the Louvre

Besant \'be-s 3 nt\, Annie orig.

Annie Wood (b. Oct. 1, 1847,

London, Eng. — d. Sept. 20, 1933,

Adyar, Madras) British social reformer. She was a prominent Fabian socialist in the 1880s before becoming an adherent of theosophy in 1889. She served as international president of the Theosophical Society from 1907 until her death, and her writings are still considered some of the best expositions of theosophical belief. After immigrating to India, she became an Indian independence leader and established the Indian Home Rule League in 1916.

Bessarabia \,be-s9-'ra-be-9\ Region, eastern Europe. It is bounded by the Prut and Dniester rivers, the Black Sea, and the Danube River delta. Greek colonies were founded on its Black Sea coast in the 7th century bc, and it was probably part of Dacia in the 2nd century ad. It became part of Moldavia in the 15th century; the Turks later annexed the southern portion into the Ottoman empire. The remainder fell to them in the 16th century when Moldavia submitted to the Turks; Bessarabia remained under Turkish control until the 19th century. Russia acquired it and half of Moldavia in 1812 and retained control until World War I. A nationalist movement developed, and after the Russian Revolution of 1917 Bessarabia declared its independence and voted to unite with Romania. The Soviet Union never recognized Romania's right to the province and in 1940 demanded that it cede Bessarabia; when Romania complied, the U.S.S.R. set up the Moldavian Soviet Socialist Republic (see Moldova), and incorporated the northern region into the Ukrainian S.S.R. Bessarabia remained divided after Ukraine and Moldavia declared independence in 1991.

Bessel \'be-sol\, Friedrich Wilhelm (b. July 22, 1784, Minden, Brandenburg — d. March 17, 1846, Konigsberg, Prussia) German astronomer. He was the first to measure (by means of parallax) the distance to a star other than the Sun. One of his major discoveries was that the bright stars Sirius and Procyon make tiny motions explainable only by the existence of invisible companions disturbing their motions. His observation of tiny irregularities in the orbit of Uranus, which he concluded were caused

by an unknown planet beyond, led to the discovery of Neptune. His mathematical functions for studying planetary motions became widely used in solving a wide range of differential equations.

Bessemer, Sir Henry (b. Jan. 19, 1813, Charlton, Hertfordshire, Eng. — d. March 15, 1898, London) British inventor and engineer. Son of a metallurgist, he set up his own casting business at 17. At that time the

only iron-based construction materials were cast iron and wrought iron. So-called steel was made by adding carbon to pure forms of wrought iron (see wootz); the resulting material was used almost entirely for cutting tools. During the Crimean War Bessemer worked to devise a stronger cast iron for cannon. The result was a process for the inexpensive production of large, slag-free ingots of steel as workable as any wrought iron. He eventually also discovered how to remove excess oxygen from the iron. The Bessemer process (1856) led to the development of the Bessemer converter. See also basic Bessemer process; R.F. Mushet; puddling process.

Bessel, engraving by E. Mandel after a painting by Franz Wolf

THE BEIT MANN ARCHIVE

Bessemer process Technique for converting pig iron to steel invented by Henry Bessemer in England in 1856 and brought by him into commercial production in 1860.

Air blown through liquid pig iron in a refractory-lined converter oxidizes the carbon and silicon in the iron.

Heat released by the oxidation keeps the metal molten. R.F. Mushet contributed the technique for deoxidizing the converted metal that made the process a success. William Kelly conducted experiments with an air-blown converter between 1856 and 1860 in Kentucky and Pennsylvania, but failed to make steel. Alexander L. Holley built the first successful Bessemer steel plant in the U.S. in 1865. High-volume production of low-cost steel in Britain and the U.S. by the Bessemer process soon revolutionized building construction and provided steel to replace iron in railroad rails and many other uses. The Bessemer process was eventually superseded by the open-hearth process. See also basic Bessemer process.

Bessemer, detail of an oil painting by Rudolf Lehmann; in the Iron and Steel Institute, London

COURTESY OF THE IRON AND STEEL INSTITUTE, LONDON;

PHOTOGRAPH, THE SCIENCE MUSEUM, LONDON

Bessey, Charles E(dwin) (b. May 21, 1845, near Milton, Ohio, U.S.— d. Feb. 25, 1915, Lincoln,

Neb.) U.S. botanist. He taught at Iowa State Agricultural College (1870-84) before joining the faculty of the University of Nebraska. By then he had so developed the experimental study of plant morphology that the recently founded university immediately became one of the nation’s outstanding centres for botanical research. He wrote widely popular textbooks that dominated U.S. botanical instruction for more than 50 years.

Besson \bes-'o n \, Jacques (b.

1540, Grenoble, France— -d. 1576,

Orleans) French engineer. His

1910

Bessey, c.

improvements in the LATHE were of courtesy of hunt institute for botanical

, . . • . . , . DOCUMENTATION, CARNEGIE MELLON UNIVERSITY,

great importance in the development Pittsburgh, pa.

of the machine-tool industry and of

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scientific instrumentation. His designs were illustrated in great detail in his Theatrum instrumentorum et machinarum (1569). Among many innovations, Besson introduced cams and templates (patterns used to guide the form of a piece being made) to the screw-cutting lathe, thus increasing

the operator’s control of tool and workpiece and permitting production of more accurate and intricate work in metal.

Best, Charles H(erbert) (b. Feb. 27, 1899, West Pembroke, Maine, U.S. — d. March 31, 1978, Toronto, Ont., Can.) U.S.-born Canadian physiologist. He was a professor and administrator at the University of Toronto 1929-67. With Frederick Banting, he was the first to obtain a pancreatic extract of insulin in a form useful for controlling diabetes mellitus (1921). He did not receive the 1923 Nobel Prize for Physiology or Medicine with Banting and J . J . R. Macleod because he did not yet have his medical degree, although Banting voluntarily shared his portion of the prize with Best. Best also discovered the vitamin choline and the enzyme histaminase and was one of the first to introduce anticoagulants to treat thrombosis.

bestiary Medieval European work in verse or prose, often illustrated, consisting of a collection of stories, each based on a description of certain qualities of the subject, usually an animal or a plant. The stories were allegories, used for moral and religious instruction and admonition. They ultimately were derived from the Greek Physiologus, a text compiled by an unknown author before the mid 2nd century ad. Many traditional attributes of real or mythical creatures derive from bestiaries, such as the phoenix’s burning itself to be born again and the parental love of the pelican, which, believed to feed its young by gashing its own breast, became a symbol of Christ.

beta \'ba-to\ -blocker in full beta-adrenergic blocking agent

Any of a class of synthetic drugs used to treat a wide range of diseases and conditions of the sympathetic nervous system (see autonomic nervous system). Stimulation by epinephrine of beta-adrenergic receptors, which are predominately found in the heart but are also present in vascular and other smooth muscle, results in excitation of the sympathetic nervous system. By preventing that excitation, beta-blockers are useful in controlling anxiety, hypertension, and a variety of heart conditions (see heart disease). They reduce the risk of a second heart attack.

beta decay Any of three processes of radioactive disintegration in which a beta particle is spontaneously emitted by an unstable atomic nucleus in order to dissipate excess energy. Beta particles are either electrons or positrons. The three beta-decay processes are electron emission, positron emission, and electron capture. The process of beta decay increases or decreases the positive charge of the original nucleus by one unit without changing the mass number. Though beta decay is in general a slower process than gamma or alpha decay, beta particles can penetrate hundreds of times farther than alpha particles. Beta decay half-uves are a few milliseconds or more. See also radioactivity.

Betancourt X.be-.tan-'kurV, Romulo (b. Feb. 22, 1908, Guatire, Miranda, Venez. — d. Sept. 28, 1981, New York, N.Y., U.S.) President of Venezuela (1945-48, 1959-64). As a youth he was active against the dictatorial regime of Juan Vincente Gomez (1857/64-1935). After a brief period in the Communist Party, he turned against it and helped found the left-wing anticommunist party Accion Democratica, which came to power in 1945 after a coup. As provisional president, he pursued a policy of moderate social reform before resigning to permit election of a successor. Elected to a second term in 1959, he steered a middle course between pro-Cuban communists and frightened conservatives, initiating an ambitious public-works program and fostering industrial development, mostly

financed by Venezuela’s vast oil exports. He retired in 1964.

betel \'be-t 3 l\ Either of two different plants that are widely used in combination for chewing purposes in southern Asia and the East Indies.

The betel nut is the seed of the areca, or betel, palm (Areca catechu), family Palmae; the betel leaf is from the betel pepper, or pan plant (Piper betle), family Piperaceae. For chewing, a small piece of the areca palm’s fruit is wrapped in a leaf of the betel pepper, along with a pellet of lime to cause salivation and release the stimulating alkaloids. Chewing results in a heavy flow of brick-red saliva, which may temporarily dye the mouth, lips, and gums orange-brown. Betel nuts yield an alkaloid that veterinarians use as a worming agent.

Betelgeuse \'be-t 3 l-jus\ (from Arabic bat al-dshauza, “the giant’s shoulder”) Brightest star in the constellation Orion, marking the hunter’s eastern shoulder. About 430 light-years from Earth, Betelgeuse is easily identifiable by its brightness, its position in brilliant Orion, and its deep reddish colour. It is a red supergiant star, one of the largest known; its diameter is roughly 500 times that of the Sun.

Bethe \'ba-t9\, Hans (Albrecht) (b. July 2, 1906, Strassburg, Ger. — d. March 6, 2005, Ithaca, N.Y., U.S.) German-bom U.S. theoretical physicist. His work helped shape quantum mechanics and increased understanding of the forces governing the structures of atomic nuclei. Bethe fled Germany in 1933 and taught at Cornell University (1935-75). He showed how the electric field surrounding an atom in a crystal affects the atom’s energy states. He was the first to propose the carbon cycle as a source of energy production in stars (1939). He headed the Theoretical Physics Division of the Manhattan Project, but in the postwar era he worked to publicize the threat of nuclear warfare. He was awarded the Max Planck Medal (1955) and the Enrico Fermi Award (1961) and received the 1967 Nobel Prize for Physics.

Bethel City, ancient Palestine. It is located near the modern town of Baytin in the West Bank and lies about 10 mi (16 km) north of Jerusalem. Important in Old Testament times, it was associated with Abraham and Jacob. After the division of Israel, Bethel was made the chief sanctuary of the northern kingdom (Israel) and was later the centre for the prophetic ministry of Amos.

Bethlehem Arabic Bayt Lahm Town (pop., 2005 prelim.: 29,000), West Bank, south of Jerusalem. An ancient town of Judaea, it was the early home of King David. A Roman garrison was stationed there during the Second Jewish Revolt (ad 135). Christians regard it as the birthplace of Jesus, and in the early 4th century the Church of the Nativity, located on what is believed to be the site of Jesus’ birth, was built there. Bethlehem was included in the British mandate of Palestine (1923-48); in 1950, following the first Arab-Israeli war (1948-49), it was annexed by Jordan.

After the Six-Day War (1967), it became part of the West Bank territory under Israeli administration. Under an agreement reached in 1995, Israel ceded rule of the town to a Palestinian Authority. Long an important pilgrim and tourist centre, it is also an agricultural market closely linked to Jerusalem.

Bethlehem City (pop., 2000: metro area, 71,329), eastern Pennsylvania, U.S. With Allentown and Easton it forms an urban industrial complex. Founded in 1741 by Moravian missionaries, it was the site of a hospital for Continental soldiers during the American Revolution. Industrialization began with the opening of the Lehigh Canal (1829) and the founding of the forerunner of the Bethlehem Steel Corp. (1857); the city became a major steel-producing centre. Its economy has since diversified to include textiles, metal products, furniture, and chemicals.

Bethlehem Steel Corp. U.S. corporation created in 1904 to consolidate Bethlehem Steel Co., the Union Iron Works, and a few smaller companies. Its principal founder was Charles M. Schwab. In its early decades Bethlehem Steel (based in Bethlehem, Pa.) produced primarily coal, iron ore, and steel; it supplied the steel for the Golden Gate Bridge.

In later decades it diversified into plastics, chemicals, and nonferrous ores. By the late 20th century it had become one of the largest steel producers in the U.S. , with operations in Pennsylvania, Indiana, Maryland, and New York. The company’s high labour costs, aging infrastructure, and inability to compete globally led to its liquidation in 2003.

Bethmann Hollweg Vbat-.man-
hol-.vekV Theobald von (b. Nov. Theobald von Bethmann Hollweg,

29, 1856, Hohenfinow, Prussia— d. detail from a portrait by Brant, 1 909.
Jan. 1 , 1921, Hohenfinow, Germany) archiv fur kunst und geschichte, Berlin

The betel nut, seed of the areca palm [Areca catechu)

WAYNE LUKAS-GROUP IV-THE NATIONAL AUDUBON SOCIETY COLLECTION/PHOTO RESEARCHERS

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German politician and chancellor (1909-17). A member of the civil service, he was appointed Prussian minister of the interior in 1905 and became German chancellor in 1909. Before World War I, he allowed the militarist factions to dominate the government; in 1914 he supported a "blank check" to Austria-Hungary for measures against Serbia. In 1916 he tried to secure the mediation of the U.S. to end the war, but he also failed to restrict submarine warfare. In 1917 he angered conservatives by promises of electoral reforms in Prussia and was forced to resign.

Bethune \be-'thim\, Louise Blanchard orig. Jennie Louise Blanchard (b. July 21, 1856, Waterloo, N.Y., U.S.— d. Dec. 18, 1913, Buffalo, N.Y.) First professional woman architect in the U.S. She opened an independent office in Buffalo in 1881. Her firm designed several hundred buildings throughout New York state, many of them in the Romanesque revival style popular in the late 19th century. In 1888 she became the first woman elected to the American Institute of Architects.

Bethune \ba-'th(y)iin\ / Mary (Jane) McLeod orig. Mary Jane McLeod (b. July 10, 1875, Mayesville, S.C., U.S.— d. May 18, 1955, Daytona Beach, Fla.) U.S. educator. Born to former slaves, she made her way through college and in 1904 founded a school that later became part of Bethune-Cookman College in Daytona Beach, Fla. She was president of the college in 1923-42 and 1946-47, also serving as a special adviser to Pres. Franklin Roosevelt. Prominent in African-American organizations, particularly women's groups, she directed the Division of Negro Affairs of the National Youth Administration (1936-44).

Bethune \b3-'thiin\ / (Henry) Norman (b. March 3, 1890, Gravenhurst, Ont., Can. — d. Nov. 12, 1939, Huang Shikou, Hebei, China) Canadian surgeon and political activist. He began his medical career in 1917, serving with Canadian forces in World War I. During the Spanish Civil War he was a surgeon with the loyalist forces, setting up the first mobile blood-transfusion service. After a trip to the Soviet Union in 1935, he joined the Communist Party of Canada. In 1938 he left Canada to serve as a surgeon with the Chinese army in its war with Japan, organizing field hospitals and setting up medical schools. He became a national hero of China.

Betjeman Vbech-o-monV Sir John (b. Aug. 28, 1906, London, Eng. — d. May 19, 1984, Trebetherick, Cornwall) English poet. His poetry volumes include Mount Zion (1933), High and Low (1966), and A Nip in the Air (1974), and his prose works include guidebooks to English counties and essays on places and buildings. His nostalgia for the near past, his exact sense of place, and his precise rendering of social nuance made him widely read at a time when much of what he wrote about was vanishing. From 1972 until his death he served as poet laureate of England.

Bettelheim Vbe-tol-.hlnA, Bruno (b. Aug. 28, 1903, Vienna, Austria — d. March 13, 1990, Silver Spring, Md., U.S.) Austrian-U.S. psychologist. Trained in Vienna, he was arrested by the Nazis and interned in concentration camps (1938-39). He immigrated to the U.S., where from 1944 he directed the University of Chicago's Orthogenic School, a laboratory school for disturbed children, and became known especially for his work with autistic children. He applied psychoanalytic principles to social problems, especially in child rearing. His works include an influential paper on adaptation to extreme stress (1943), "Love Is Not Enough"

(1950), as well as The Informed Heart (1960), The Empty Fortress (1967), Children of the Dream (1967), and The Uses of Enchantment (1976). Depressed after the death of his wife and after suffering a stroke, he took his own life. His reputation was later clouded by revelations that he had invented his academic credentials and had abused and misdiagnosed children at his school.

Better Business Bureau Any of several U.S., Puerto Rican, and Canadian organizations formed to protect communities from unfair, misleading, or fraudulent advertising and selling practices. Organized at the local level, Better Business Bureaus investigate and set standards for business practices, receive complaints of improper practices, and conduct educational campaigns alerting the public to methods of deceit and fraud in advertising and selling.

Betti \'bat-te\, Ugo (b. Feb. 4, 1892, Camerino, Italy — d. June 9, 1953, Rome) Italian playwright. He pursued a legal career, serving as a judge and as librarian of the Ministry of Justice in Rome. He wrote three volumes of poetry, three collections of short stories, and 26 plays. His first play, The Landlady (1927), drew mixed reviews, but later works were more successful. Several were translated into French and English and

performed in Paris, London, and New York City, including Landslide (1933), Corruption in the Palace of Justice (1949), The Queen and the Rebels (1951), and The Fugitive (1953).

Betwa River \'ba-twa\ River, northern India. Rising in western Madhya Pradesh state, it flows northeast 380 mi (610 km) through Uttar Pradesh state into the Yamuna River near Hamirpur. Nearly half its course is unnavigable. The Matatila Dam, a joint venture between the two states, is near Jhansi.

Beust \'boist\, Friedrich Ferdinand, count von (b. Jan. 13, 1809, Dresden, Saxony — d. Oct. 24, 1886, Schloss Altenberg, near Vienna, Austria-Hungary) German statesman. A career diplomat in Saxony from 1830, he served as its foreign minister (1849-53) and its interior minister (1853-66). Often opposed to Otto von Bismarck, Beust was forced to resign in 1866. Saxony’s ally, the Habsburg emperor Francis Joseph, then appointed him Austrian minister for foreign affairs (1866) and imperial chancellor (1867-71). As chancellor, Beust negotiated the Compromise of 1 867 and helped restore the Habsburgs’ international position. He later served as ambassador to England (1871-78) and France (1878-82).

Beuve, Charles-Augustin Sainte- See C.-A. Sainte-Beuve

Beuys \'bois\, Joseph (b. May 12, 1921, Krefeld, Ger. — d. Jan. 23, 1986, Diisseldorf, W.Ger.) German avant-garde sculptor and performance artist. He served in the German air force in World War II and later studied art in Diisseldorf (1947-51); in 1961 he was appointed professor of sculpture at its art academy. In the 1960s he worked with the international group Fluxus, whose emphasis was not on what an artist makes but on his or her personality, actions, and opinions. Beuys’s most famous and controversial performance was How to Explain Pictures to a Dead Hare (1965), in which he walked around an art gallery with his face covered in honey and gold leaf, talking to a dead hare about human and animal consciousness. He also became known for sculptural works that utilized fat and layers of felt. He succeeded in creating a popular personal mythol-

ogy and was one of the most influential artists and teachers of the later 20th century.

Bevan Vbev-onX, Aneurin (b. Nov. 15, 1897, Tredegar, Monmouthshire, Eng. — d. July 6, 1960, Chesham, Buckinghamshire) British politician. As a young man, he entered Labour Party politics and was elected to the House of Commons in 1929. He overcame a speech impediment to become a brilliant orator. As minister of health in Clement Attlee's government (1945-51), "Nye" Bevan established the National Health Service. He was minister of labour (1951) but resigned in protest against rearmament expenditures that reduced spending on social programs. A controversial figure in the Labour Party, he headed its left-wing (Bevanite) group and was the party's leader until 1955.

Beveridge Vbev-,rij\, Albert J(eremiah) (b. Oct. 6, 1862, Highland county, Ohio, U.S. — -d. April 27, 1927, Indianapolis, Ind.) U.S. senator and historian. He was admitted to the Indiana bar in 1887 and began the practice of law in Indianapolis. Elected as a Republican to the U.S. Senate (1900-12), he supported the progressive legislation proposed by Pres. Theodore Roosevelt. In 1912 he broke with the conservative wing of the Republican Party to serve as chairman of the convention that organized the Progressive Party and nominated Roosevelt for president. He subsequently retired from public life to write several historical works, including the four- volume Life of John Marshall (1916-19), which won a Pulitzer Prize.

Beveridge (of Tuggal), William Henry, 1st Baron (b. March 5, 1879, Rangpur, India — d. March 16, 1963, Oxford, Oxfordshire, Eng.) British economist. He took a lifelong interest in the problem of unemployment and served as director of labour exchanges (1909-16). He directed the London School of Economics (1919-37), then became master of University College, Oxford (1937-45). Invited by the government to become the architect of the new British welfare state, he helped shape Britain's social policies and institutions through the Beveridge Report (1942). His books included Insurance for All (1924), Full Employment in a Free Society (1944), and Pillars of Security (1948).

Beverly Hills City (pop., 2000: 33,784), southwestern California, U.S. It is surrounded by the city of Los Angeles and adjoining Hollywood. It was established in 1906 as a residential area called Beverly. The Beverly Hills Hotel was built in 1912. Movie stars Mary Pickford and Douglas Fairbanks lived there in 1919, beginning the fashion among Hollywood celebrities of building lavish homes in Beverly Hills. Occupying an area

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of 5.7 sq mi (14.8 sq km), the city is crossed by the famous streets of Sunset Boulevard, Santa Monica Boulevard, and Rodeo Drive.

Bevin, Ernest (b. March 9, 1881, Winsford, Somerset, Eng. — d. April

14, 1951, London) British labour leader and statesman. Active in labour organizations from 1905, he became head of the Dockers' Union. In 1921 he merged several unions into the Transport and General Workers' Union, which became the world's largest trade union, and served as its general secretary until 1940. He was a forceful minister of labour and national service in Winston Churchill's wartime coalition government (1940-45). As foreign secretary in Clement Attlee's Labour government (1945-51), he negotiated the Brussels Treaty and helped establish NATO.

Bewick, Thomas (b. Aug. 12, 1753, Cherryburn, Eng. — d. Nov. 8, 1828, Gateshead) British wood engraver. At age 14 he was apprenticed to a metal engraver, with whom he later went into partnership in Newcastle; Bewick remained there most of his life. He rediscovered the technique of wood engraving, which had declined into a reproductive technique, and brought to it brilliant innovations, such as the use of parallel lines instead of cross-hatching to achieve a wide range of tones and textures. He also developed a method of printing gray backgrounds to heighten the effect of atmosphere and space. Some of his finest works are illustrations for books on natural history. He established a school of engraving in Newcastle.

Bezos \'ba-zos\, Jeff(rey P.) (b.

Jan. 12, 1964, Albuquerque, N.M.,

U.S.) U.S. Internet entrepreneur.

Educated at Princeton University, he worked in banking and investment at Bankers Trust and D.E. Shaw & Co. before founding Amazon.com, Inc., in 1995. The Internet company began as a bookseller and later expanded into recorded music, videos, electronic equipment, tools, and other areas, including on-line auctions. Amazon.com became famous for the extraordinary rise in its stock-market valuation despite continued annual losses — a reflection of investor confidence in the future of on-line retailing that marked the late 1990s. The company posted its first quarterly profit in January 2002.

B had raca rya - pranidhana \,bad-r9-char-'y a-.pra-ne-do-'naX

Mahayana Buddhist text that is also important to Tibetan Buddhism. It is related to the Avatamsaka-sutra and is considered by some to be its final section. It presents ten vows of the bodhisattva Samantabhadra. These became daily lessons in Chinese monasteries. By keeping the vows, including inexhaustible service to all buddhas and the embracing of all universes, the faithful can realize the universe of interdependent phenomena manifested in the Buddha and enter into the Pure Land of Amitabha.

Bhagavadgita Vba-go-.vad-'ge-toV (Sanskrit: "Song of God") One of

the greatest of the Hindu scriptures, constituting part of the Mahabharata. It is written in the form of a dialogue between the warrior Prince Arjuna and the charioteer Krishna, an incarnation of Vishnu. It was probably composed in the 1st or 2nd century ad, later than much of the epic. Concerned over the suffering the impending battle will cause, Arjuna hesitates, but Krishna explains that the higher way is the dispassionate discharge of duty without concern for personal triumph. The Bhagavadgita considers the nature of God and ultimate reality and offers three disciplines for transcending the limitations of this world: jnana (knowledge or wisdom), karma (dispassionate action), and bhakti (love of God). It has inspired numerous commentaries over the centuries, including those by Ramanuja and Mohandas K. Gandhi.

Bhagavata Vba-go-.vo-toV Member of the earliest recorded Hindu sect, representing the beginnings of theistic, devotional worship and modem Vaishnavism. The Bhagavata sect originated in the Mathura region c. 3rd-2nd century bc and spread through western, northern, and southern India. The faith centers on devotion to a personal god, variously called Vishnu, Krishna, Hari, or Narayana. The Bhagavadgita (lst-2nd century ad) is the

earliest exposition of the Bhagavata system, but its central scripture is the Bhagavata Purana. The sect was prominent within Vaishnavism until the 11th century, when bhakti (devotional worship) was revitalized by Ramanuja.

bhakti \'bok-te\ Southern Asian devotional movement, particularly in Hinduism, emphasizing the love of a devotee for his or her personal god. In contrast to Advaita, bhakti assumes a dualistic relationship between devotee and deity. Though Vishnu, Shiva, and Shakti (see shakti) all have cults, bhakti characteristically developed around Vishnu’s incarnations as Rama and Krishna. Practices include reciting the god’s name, singing hymns, wearing his emblem, and making pilgrimages. The fervour of South Indian hymnists in the 7th- 10th centuries spread bhakti and inspired much poetry and art. Poets such as Mirabai conceived of the relationship between the worshiper and the god in familiar human terms (e.g., the lover and beloved), while more abstract poets such as Kabir and his disciple Nanak, the first Sikh Guru and founder of Sikhism, portrayed the divinity as singular and ineffable.

bharata natya Vba-ro-to-'nat-yoX Principal classical dance style of India, indigenous to Tamil Nadu and prevalent in South India. It expresses Hindu religious themes, and its techniques and terminology are found in the treatise Natya-shastra , written by the sage Bharata (3rd century ad). One dancer performs the entire two-hour program, accompanied by drums, drone, and singer. Originally performed only by female temple dancers, the art fell into disrepute as temple dancing became associated with prostitution, but it was revived in its original purity in the late 19th century. It was not brought to the stage until the 1930s.

Bharatiya Janata Party (BJP) English Indian People's Party

Pro-Hindu political party of India. The BJP traces its roots to the the Bharatiya Jana Sangh (founded in 1951), which advocated the rebuilding of India in accordance with Hindu culture. The BJP was formally established in 1980. It achieved its first significant electoral success in 1989, though in 1992 the destruction of the Babri Mosjid (Mosque of Babur) in Ayodhya caused a backlash against it. In 1996 the BJP formed a short-

lived government. Two years later the party and its allies formed a majority government with Atal Bihari Vajpayee as prime minister. Vajpayee again became prime minister in 1998 as head of a coalition of the BJP and other parties. In 2004, however, the coalition was defeated in parliamentary elections, and Vajpayee resigned from office.

Bharatpur Vbo-rot-.piuA or Bhurtpore Vbort-.porX City (pop., 2001 prelim.: 204,456), Rajasthan state, northwestern India. Located west of Agra, it was founded c. 1733 and was the capital of the princely state of Bharatpur. It was so strongly fortified that it successfully resisted the British siege in 1805, and it was not taken by them until 1826. The city is renowned for the superb bird sanctuary at nearby Keoladeo National Park.

Bharhut \'ba-rot\ sculpture Indian sculpture from the mid 2nd century bc that decorated the great stupa, or relic mound, of Bharhut, in Madhya Pradesh, India. It is now mostly destroyed; the railings and gateways that remain are in Kolkata’s (Calcutta’s) Indian Museum. The ornamental medallions depicting legends of the Buddha’s previous births and events in his life are labeled and so are indispensable for an understanding of Buddhist iconography. The Bharhut style marked the beginning of a tradition of Buddhist narrative relief and decoration of sacred buildings that continued for several centuries.

Bhartrhari \'ba-tro-re\ (b. 570?, Ujjain, Malwa, India — d. 651?, Ujjain) Indian Hindu philosopher, poet, and grammarian. He was of noble birth; according to legend, he made seven attempts to renounce the world for monastic life before eventually becoming a yogi and moving into a cave near Ujjain. Vakyapadiya is his major work on the philosophy of language. Also ascribed to him are three collections of poetry, each containing 100 verses: Shrngara-shataka (on love), Niti-shataka (on ethics and polity), and Vairagya-shataka (on dispassion). His poem Bhatti kavya demonstrates the subtleties of Sanskrit.

Bhasa Vba-soX (b. 3rd century ad) Indian dramatist. The earliest known dramatist in Sanskrit, he was known only by the allusions of other Sanskrit dramatists until the texts of 13 of his dramas were discovered and published in 1912. Most of his works are adaptations of themes of heroism and romantic love borrowed from two epics, the Ramayana and the Mahabharata. He diverged from the conventions of the time by portraying battles and killings on the stage. His influence is seen in the works of the 5th-century dramatist Kalidasa.

THE TAWNY OWL.-

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(Stnr StruWc, Linn.—// Ckat-tuaml, Buft

The Tawny Owl, wood engraving by
Thomas Bewick, from his History of
British Birds, 1 797-1 804.

COURTESY OF THE TRUSTEES OF THE BRITISH MUSEUM;
PHOTOGRAPH, J.R. FREEMAN & CO. LTD.

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Bhaskara I (fl. c. 629, possibly Valabhi, India) Indian astronomer and mathematician. His fame rests on three treatises he composed on the works of Aryabhata I (b. 476). Two of these, known today as Mahabhaskariya (“Great Book of Bhaskara”) and Laghubhciskariya (“Small Book of Bhaskara”), are astronomical works in verse, while Aryabhatiyabhashya (629) is a prose commentary on the Aryabhatiya of Aryabhata. Bhaskara stressed the importance of proving mathematical rules rather than just relying on tradition or expediency.

Bhaskara II (b. 1114, Biddur, India — d. c. 1185, probably Ujjain) The leading mathematician of the 12th century. He was the lineal successor of Brahmagupta as head of an astronomical observatory at Ujjain, the leading mathematical centre of ancient India. His mathematical works were the first to make full and systematic use of the decimal system. He evidently was the first to gain some understanding of the meaning of division by zero. He used letters to represent unknown quantities, much as in modern algebra, and solved indeterminate equations of 1st and 2nd degrees. He wrote on his astronomical observations of planetary positions, conjunctions, eclipses, cosmography, geography, and the mathematical techniques and astronomical equipment used in these studies. He was also a noted astrologer.

bhiksu Vbik-shu\ Pali bhikku \'bik-ii\ In Buddhism, a member of the sangha, the ordained order of men established by the Buddha. (Female orders exist in some Mahayana Buddhist traditions). Originally they were mendicant followers of the Buddha who taught Buddhist ways in return for food. Today children may enter monastic life as novices, but candidates for ordination must be 21 years old. There are some 200 rules; sexual relations, taking of life, stealing, or boasting of spiritual attainment will lead to expulsion. A bhiksu shaves his head and face, owns a few essential items, and begs daily for his food. Theravada Buddhism forbids monks to handle money and perform labour. Chan (Zen) Buddhism requires monks to work. See also Vinaya Pitaka.

Bhima River Vbe-msX River, southwestern India. Rising in Maharashtra state in the Western Ghats east of Mumbai (Bombay), it flows southeast 450 mi (725 km) through southern Maharashtra, northern Karnataka, and central Andhra Pradesh to join the Krishna River. The Bhima’ s banks are heavily populated. Its water level rises sharply during the monsoons, and receding floodwaters form fertile farming belts.

Bhopal \bo-'pal\ City (pop., 2001 : 1,437,354), capital of Madhya Pradesh state, India. Situated northwest of Nagpur, it is primarily an industrial city and a major rail junction. It is the site of India’s largest mosque and home to several colleges. In 1984 Bhopal became the site of one of the worst industrial accidents in history when tons of toxic gas escaped from a Union Carbide insecticide plant and spread over a densely populated area; the final death toll was estimated to be between 15,000 and 20,000, with some half-million survivors suffering various ailments.

Bhopal Former princely state, central India. It is crossed by the Vindhya Mountains; the Narmada River is its southern boundary. It was founded in 1723 by an Afghan adventurer. In its struggles with the Marathas, Bhopal was itself friendly to the British and concluded a treaty with them in 1817. It was a major component of the Bhopal Agency and the second largest Muslim principality of the British Empire. At India’s independence, Bhopal remained a separate Indian province. When it was incorporated into Madhya Pradesh in 1956, Bhopal city became the state’s capital.

Bhubaneshwar \,bu-b3-'nesh-w3r\ City (pop., 2001 prelim.: 647,302), capital of Orissa, eastern India. Its history from the 3rd century bc is represented in nearby archaeological remains. From the 5th to the 10th century ad it was the provincial capital of many Hindu dynasties. Its many temples, displaying every phase of Orissan architecture, were built from the 7th to the 16th century. It became the state capital in 1950.

Bhumibol Adulyadej or Phumiphon Adunlayadet

Vpu-me-.pon-a-'dun-lo-.datV or Rama IX (b. Dec. 5, 1927, Cambridge, Mass., U.S.) Ninth king of the Chakri dynasty and Thailand’s longest-ruling monarch. A grandson of King Chulalongkorn, he succeeded to the throne in 1946 after the death of his older brother, King Ananda Mahidol (r. 1935-46). His role as head of state is largely ceremonial, but he moderates between extreme parties in Thai politics and serves as a focus of national unity.

Bhurtpore See Bharatpur

Bhutan \bii-'tan\ officially Kingdom of Bhutan Kingdom, Himalayas, south-central Asia. Area: 14,824 sq mi (38,394 sq km). Population (2005 est.): 776,000. Capital: Thimphu. There are three main ethnic groups:

Nepalese in the southwest. Languages:

Dzongkha (official), Tibetan dialects. Religions: Mahayana Buddhism (official); also Hinduism. Currency: ngultrum. The northern part of the country lies in the Great Himalayas, with peaks surpassing 24,000 ft (7,300 m) and high valleys lying at 12,000-18,000 ft (3,700-5,500 m). Spurs radiate southward, forming the Lesser Himalayan ranges. Several fertile valleys there, at elevations of 5,000-9,000 ft (1,500-2,700 m), are fairly well populated and cultivated. South of these mountains lies the Duars Plain, controlling access to the strategic mountain passes; much of it is hot and steamy and covered with dense forest. The Bhutanese economy is mainly agricultural; nearly all exports go to India. Bhutan is a monarchy with one legislative house; the head of state is the monarch, and the head of government is the prime minister. Bhutan’s mountains and forests long made it inaccessible to the outside world, and its feudal rulers banned foreigners until well into the 20th century. It nevertheless became the object of foreign invasions; in 1865 it came under British influence, and in 1910 it agreed to be guided by Britain in its foreign affairs. It later became oriented toward British-ruled India, though much of its trade continued to be with Tibet. India took over Britain’s role in 1949, and the Chinese army’s presence in neighbouring Tibet since 1950

further strengthened Bhutan's ties with India. The apparent Chinese threat made its rulers aware of the need to modernize, and it has embarked on a program to build roads and hospitals and to create a system of secular education.

Bhutto Vbii-toV, Benazir (b. June 21, 1953, Karachi, Pak.) Pakistani politician, the first woman leader of a Muslim nation in modem history. After receiving an education at Harvard and Oxford, she led the political opposition to Pres. Zia-ul-Haq after the execution of her father, Zulfikar An Bhutto in 1979. She subsequently endured frequent house arrest (1979-84) and was exiled (1984-86). When Zia died in a plane crash in 1988, she became prime minister of a coalition government. She was unable to do much to combat Pakistan's widespread poverty, governmental corruption, and increasing crime, and her government was dismissed in 1990 on charges of corruption and other malfeasance. A second stint as prime minister (1993-96) ended similarly. In 1999 she was convicted of taking kickbacks from a Swiss company and sentenced in absentia to five years in prison.

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Bhutto, Zulfikar Ali (b. Jan. 5, 1928, near Larkana, Sindh, India — d. April 4, 1979, Rawalpindi, Pak.) President (1971-73) and prime minister (1973-77) of Pakistan. Son of a prominent politician, he was educated in India, the U.S., and Britain. He served eight years in the government of Mohammad Ayub Khan (1907-74) then resigned to form the Pakistan People's Party (1967). After the overthrow of the Ayub Khan regime and the Pakistani civil war, Bhutto became president (1971). He nationalized several key industries and taxed landed families. He became prime minister in 1973, and his government, retaining martial law, began a process of Islamization. Bhutto's party won elections in 1977, but the opposition accused him of electoral fraud. Gen. Zia-ul-Haq seized power and had Bhutto imprisoned and later executed. Benazir Bhutto is his daughter.

Biafra \be-'af-r3\ Former secessionist state, West Africa. It constituted the former Eastern Region of Nigeria, inhabited principally by the Igbo. In a period of political and economic instability in the 1960s, the resentment of the Hausa in the north toward the more prosperous and educated Igbo exploded in fighting and massacres, which led to the secession of the Eastern Region as the state of Biafra in 1967. A costly civil war and the death by starvation of an estimated one million civilians ended in Biafra's collapse and reincorporation into Nigeria in 1970.

Biafra, Bight of Inlet of the Atlantic Ocean, West Africa. The innermost bay of the Gulf of Guinea, it is bounded by Nigeria, Cameroon, Equatorial Guinea, and Gabon, and receives portions of the Niger and Ogooue rivers. It includes several islands, including Bioko. Its ports include Malabo, Calabar, and Douala. In the 16th- 19th century the bay was the scene of extensive slave dealing. By the 1830s palm-oil trading had surpassed

slave trading. Today petroleum is a major economic resource.

Biafystok \bya-'wi-stok\ City (pop., 2000 est: 285,500), northeastern Poland. Founded in the 14th century, it was annexed to Prussia in 1795–1807. It passed to Russia, was captured by Germany in 1915, and was restored to Poland in 1919. During World War II it was overrun by Germans in 1941, then retaken by Soviet troops in 1944. Returned to Poland in 1945, it is now an important rail junction; it has been a major textile producer since 1863.

Biarritz \bya-'rets\ Town (pop., 1999: 30,005), southwestern France. It lies on the Gulf of Gascogne (Bay of Biscay) near Bayonne, 11 mi (18 km) from Spain. Once a small fishing village, Biarritz became a fashionable summer resort after 1854 with the visits of Napoleon III; visited also by British royalty, it grew additionally as a winter residence. Its mild climate and variety of beaches, and the folklore and traditions of the local Basques, continue to draw an international clientele.

biathlon Winter sports event combining cross-country skiing with rifle sharpshooting. It originated in Scandinavian hunting. It was first included in the Winter Olympics program in 1960. Competitors cover a course, carrying a single-shot rifle and ammunition and stopping at four points to fire five shots at small targets. Events are either 10 or 20 km long, and there are a variety of race types, including relay, sprint, and pursuit.

Bibiena family See Galli Bibiena family

Bible Sacred scriptures of Judaism and Christianity. The Jewish scriptures consist of the Torah (or Pentateuch), the Neviim (“Prophets”), and the Ketuvim (“Writings”), which together constitute what Christians call the Old Testament. The Pentateuch and Joshua relate how Israel became a nation and came to possess the Promised Land. The Prophets describe the establishment and development of the monarchy and relate the prophets’ messages. The Writings include poetry, speculation on good and evil, and history. The Roman Catholic and Eastern Orthodox Bible includes additional Jewish writings called the Apocrypha. The New Testament consists of early Christian literature. The Gospels tell of the life, person, and teachings of Jesus. The Acts of the Apostles relates the earliest history of Christianity. The Epistles (Letters) are correspondence of early church leaders (chiefly St. Paul) and address the needs of early congregations. Revelation is the only canonical representative of a large genre of early Christian apocalyptic literature. See also biblical source, biblical translation. See table opposite.

biblical source Any of the original oral or written materials compiled as the Bible. While authorship of many biblical books is anonymous or pseudonymous, scholars have used internal evidence and the tools of biblical criticism to identify sources and arrange them in chronological order of composition. There are four sources for the Pentateuch: J (sources in which God is called YHWH, German JHVH), eastern (sources in which

Old Testament: Jewish Scripture

Genesis

Isaiah

Nahum

Song of Songs

Exodus

Jeremiah

Habakkuk

Ruth

Leviticus

Ezekiel

Zephaniah

Lamentations

Numbers

Hosea

Haggai

Ecclesiastes

Deuteronomy

Joel

Zechariah

Esther

Joshua

Amos

Malachi

Daniel

Judges

Obadiah

Psalms

Ezra

1 & 2 Samuel

Jonah

Proverbs

Nehemiah

1 & 2 Kings

Micah

Job

1 & 2 Chronicles

Old Testament: Roman Catholic and Protestant Canons

Catholic

Protestant

Catholic

Protestant

Genesis

Genesis

Wisdom

Exodus

Exodus

Sirach

Leviticus

Leviticus

Isaiah

Isaiah

Numbers

Numbers

Jeremiah

Jeremiah

Deuteronomy

Deuteronomy

Lamentations

Lamentations

Joshua

Joshua

Baruch

Judges

Judges

Ezekiel

Ezekiel

Ruth

Ruth

Daniel

Daniel

1 & 2 Samuel

1 & 2 Samuel

Hosea

Hosea

1 & 2 Kings

1 & 2 Kings

Joel

Joel

1 & 2 Chronicles

1 & 2 Chronicles

Amos

Amos

Ezra

Ezra

Obadiah

Obadiah

Nehemiah

Nehemiah

Jonah

Jonah

Tobit

Micah

Micah

Judith

Nahum

Nahum

Esther

Esther

Habakkuk

Habakkuk

Job

Job

Zephaniah

Zephaniah

Psalms

Psalms

Haggai

Haggai

Proverbs

Proverbs

Zechariah

Zechariah

Ecclesiastes

Ecclesiastes

Malachi

Malachi

Song of Songs

Song of Solomon

1 & 2 Maccabees

Old Testament: Protestant Apocrypha

1 & 2 Esdras

Additions to

Baruch

Bel and the

Tobit

Esther

Prayer of Azariah

Dragon

Judith

Wisdom of

Susanna

Prayer of

Solomon

Manasses

Ecclesiasticus

1 & 2 Maccabees

New Testament

Matthew

Romans

Colossians

Hebrews

Mark

1 & 2

1 & 2 Thessa-

James

Luke

Corinthians

lonians

1 & 2 Peter

John

Galatians

1 & 2 Timothy

1 , 2, 3 John

Acts

Ephesians

Titus

Jude

of the Apostles

Philippians

Philemon

Revelation

God is called Elohim), D (sources in the style of Deuteronomy), and P (for sources with priestly style and content). Parts of lost books have also been identified in the Old Testament. New Testament sources include original writings and oral traditions. The first three (synoptic) Gospels have a common source, Matthew and Luke being based on Mark and a lost source called Q; John conveys an independent tradition. Biblical sources are studied to uncover the history of the scriptures and to restore texts as closely as possible to their original content. Scholars may also analyze biblical sources in an effort to reconstruct the oral tradition behind them.

biblical translation Art and practice of translating the Bible. The Old Testament was originally written in Hebrew, with scattered passages of Aramaic. It was first translated in its entirety into Aramaic and then, in the 3rd century ad, into Greek (the Septuagint). Hebrew scholars created

the authoritative Masoretic text (6th-10th century) from Aramaic Targums, the original Hebrew scrolls having been lost. The New Testament was originally in Greek or Aramaic. Christians translated both Testaments into Coptic, Ethiopian, Gothic, and Latin. St. Jerome’s Latin Vulgate (405) was the standard Christian translation for 1,000 years. New learning in the 15th– 16th century generated new translations. Martin Luther translated the

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entire Bible into German (1522-34). The first complete English translation, credited to John Wycliffe, appeared in 1382, but it was the King James version (1611) that became the standard for more than three centuries. By the late 20th century the entire Bible had been translated into 250 languages and portions of it into more than 1,300.

bibliography Broadly, the systematic study and description of books. The word can refer to the listing of books according to some system (called descriptive, or enumerative, bibliography), to the study of books as tangible objects (called critical, or analytical, bibliography), or to the product of those activities. The purpose of bibliography is to organize information about materials on a given subject so that students of the subject may have access to it. A descriptive bibliography may take the form of information about a particular author’s works or about works on a given subject or on a particular nation or period. Critical bibliography, which emerged in the early 20th century, involves meticulous descriptions of the physical features of books, including the paper, binding, printing, typography, and production processes used, to help establish such facts as printing dates and authenticity.

Bibliotheque Nationale de France V.bib-le-o-'tek-.na-se-o-'nal-d3-'fra n s\ Most important library in France and one of the oldest in the world. The nation’s first royal library, the Bibliotheque du Roi (“King’s Library”), was established under Charles V (r. 1364-80) but later dispersed; another was established under Louis XI (r. 1461-83). From 1537 the library received a copy of every French publication. It was moved from Fontainebleau to Paris in the late 16th century and opened to the public in 1692. It acquired its current name in 1795, and its collection was expanded through Revolutionary appropriations and Napoleon’s acquisitions. In 1995 it moved to a new facility with a controversial design; this facility now houses all its books (more than 12 million), periodicals, and magazines.

bicameral system System of government in which the legislature comprises two houses. It originated in Britain (see Parliament), where eventually it served to represent the interests of both the common people and the elite and to ensure deliberation over legislation. In the U.S. the bicameral system is a compromise between the claims for equal representation among the states (each state is represented by two members of the Senate) and for equal representation among citizens (each member of the House of Representatives represents roughly the same number of people). Each house has powers not held by the other, and measures need

the approval of both houses to become law. Many contemporary federal systems of government have bicameral legislatures. All U.S. states except Nebraska have bicameral legislatures. See also Canadian Parliament; Congress of the United States; Diet.

bicarbonate of soda or sodium bicarbonate or baking soda Inorganic compound, white, crystalline salt of sodium, chemical formula NaHC0 3 . It is a weak base and dissociates into water and carbon dioxide gas as it dissolves in the presence of hydrogen ions. In addition to household uses as an antacid, cleaner, and deodorizer, it is used in manufacturing effervescent salts and beverages and baking powder. Industrial uses include production of other sodium salts, treatment of wool and silk, and use in pharmaceuticals, sponge rubber, fire extinguishers, cleaners, lab reagents, mouthwash, and gold and platinum plating.

Bichat \be-'sha\, (Marie-Francois-) Xavier (b. Nov. 11/14, 1771, Thoirette, Fra. — d. July 22, 1802, Lyon) French anatomist and physiologist. In addition to bedside observations of patients, he conducted autopsies to study the changes disease causes in various organs. With no knowledge of the cell as the functional unit of living things, Bichat was among the first to see the organs of the body as being formed through the specialization of simple, functional units (tissues). Without using a microscope, he distinguished 21 kinds of tissues that, in different combinations, form the organs of the body. His systematic study of human tissues helped create the science of histology.

bichon frise \be-,sho n -fre-'za\ Breed of small dog noted for its fluffy coat and cheerful disposition. Descended from the water spaniel, it stands about 9-12 in. (23-30.5 cm) tall and has a short, blunt muzzle; silky, drooping ears; a puffy, silky, curled coat; and an undercoat. It is mostly white, but may have shadings of cream, gray, or apricot on the head. It originated in the Mediterranean region.

Bicol \'be-,kol\ Peninsula Peninsula, southeastern Luzon, Philippines. It has a lengthy coastline with large subpeninsulas. Its area is about 4,660

sq mi (12,070 sq km). It includes the Bicol Plain, a large lowland area important in rice production. It is densely populated though largely rural. It is the homeland of the Bicol, the country’s fifth largest ethnolinguistic group, and it has been a stronghold of Philippine communists.

bicycle Lightweight, two- wheeled, steerable machine that is propelled by the rider. The wheels are mounted in a metal frame, and the front wheel is held in a movable fork. The rider sits on a saddle and steers with handlebars attached to the fork, propelling the bicycle with two pedals attached to cranks that turn a chainwheel. An endless chain transmits power from the chainwheel to a sprocket on the back wheel. A heavy, pedalless form built in 1818 was propelled simply by the rider paddling his feet against the ground. In the early 1840s Scottish blacksmith Kirkpatrick Macmillan (1813-78) built bicycles propelled by pedals, cranks, and drive rods; he is widely credited with having invented the bicycle. Important innovations were introduced by Pierre and Ernest Michaux in France in the early 1 860s, and by 1 865 their company was manufacturing 400 velocipedes a year. A lighter version produced in England in 1870 (nicknamed the “penny-farthing”) featured a large front wheel and small back wheel. By the 1890s the standard bicycle design was established, and, with the smooth ride enabled by the new pneumatic tires, its popularity exploded.

The so-called mountain bike became the standard design by the early 1990s. The bicycle is used worldwide as a basic means of transportation.

Components of a modern touring bicycle.

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Bidault \be-'do\, Georges (-Augustin) (b. Oct. 5, 1899, Moulins, France — d. Jan. 27, 1983, Cambo-les-Bains, near Bayonne) French statesman and Resistance leader in World War II. After being imprisoned in Germany (1940), he returned to France (1941) and worked with the National Council of Resistance, which he headed in 1943. He helped found the Popular Republican Movement (1944) and supported Charles de Gaulle's wartime government. After the war he briefly served twice as prime minister and three times as minister of foreign affairs. In 1958 he broke with de Gaulle and opposed Algerian independence. He advocated terrorism to prevent independence, went underground, and was forced into exile (1962-68).

Biddle, James (b. Feb. 18, 1783, Philadelphia, Pa., U.S. — d. Oct. 1, 1848, Philadelphia) U.S. naval officer. He entered the navy in 1800. During the War of 1 81 2, he served on the USS Wasp when it captured the British ship Frolic, and he commanded the USS Hornet in its victory over the Penguin. In 1817 he was sent to the Columbia River to claim the Oregon Territory for the U.S. As commodore of U.S. ships in East Asia, he negotiated the first treaty, a trade agreement, between the U.S. and China.

Biddle, John (b. 1615, Wotton-under-Edge, Gloucestershire, Eng. — d. Sept. 22, 1662, London) Father of English Unitarianism. He studied at the University of Oxford and became master of a free school in Gloucester. In 1644 he wrote Twelve Arguments Drawn Out of Scripture, denying the deity of the Holy Spirit. When the manuscript reached church authorities, he was arrested and imprisoned for two years. After its publication in 1647 he was again detained, and copies of the book were burned. His later writings attacked the doctrine of the Holy Trinity. Freed from a third imprisonment in 1652, he began to meet for worship with his adherents, who came to be called Unitarians. After Biddle published his Two-Fold Catechism (1654),

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Oliver Cromwell prevented his execution by exiling him to the Scilly Isles. He returned in 1658; in 1662 he was again put in prison, where he died.

Biddle, Nicholas (b. Jan. 8, 1786, Philadelphia, Pa., U.S. — d. Feb. 27, 1844, Philadelphia) U.S. author, financier, and lawyer. He served as secretary to Pres. James Monroe (1806-

07), then minister to England, and, afterward, while practicing law in the U.S., he wrote History of the Expedition of Captains Lewis and Clark (1814) from the explorers' notes. In 1823 Monroe appointed him president of the Second Bank of the United States. He developed the bank into the first effective U.S. central bank, sponsoring policies that curbed credit, regulated the money supply, and safeguarded government deposits. In 1832 the bank came under attack from Pres. Andrew Jackson, who managed to terminate its national charter in 1836. Biddle later became president of the bank under a Pennsylvania state charter. The Federal Reserve System was later established as the country's central bank.

Bidwell, John (b. Aug. 5, 1819, Chautauqua county, N.Y., U.S. — d. April 4, 1900, near Sacramento, Calif.) U.S. political leader. He was a member of the first group to travel by wagon train to California from Independence, Mo. Reluctant to join the Bear Flag revolt of Americans in California against Mexico, he nonetheless helped draw up the Bear Flag Republic's resolution of independence in July 1846. He fought under John C. Fremont in the Mexican War and assisted in the recapture of Los Angeles in 1847. At the end of the war he returned to Sutter's Fort, where he was the first to find gold on the Feather River. Later he became a leading agriculturalist and played a prominent role in state politics. He was elected to the House of Representatives in 1 864 and later ran for governor three times, though he was never elected. In 1 892 he became the presidential candidate of the Prohibition Party.

Biedermeier Vbe-dor-.ml-orV style Style of German and Austrian art, furniture, and decoration that developed c. 1815 to 1848. Gottlieb ("Papa") Biedermeier was a fictional cartoon character, the comic symbol of middle-class comfort, with an emphasis on family life and the pursuit of hobbies. The subject matter of Biedermeier paintings, which were either genre or historical, was treated sentimentally; Carl Spitz weg (1 808—85) is the best-known of the Biedermeier painters. The simplicity and functionality of Biedermeier furniture were derived from the Empire and Directoire styles, but the furniture was characterized by more restrained geometric shapes. The style was revived in the 1960s.

Biel \'bel\, Gabriel (b. c. 1420, Speyer [Germany] — d. Dec. 7, 1495, Tubingen, Wurttemberg) German philosopher, economist, and Scholastic theologian. He became professor at the University of Tubingen (1484). His Collectorium circa IV libros sententiarum presented the teachings of William of Ockham; the work influenced followers known as Gabrielistae. His economic theories favoured fair taxation and price control. See also Scholasticism.

Bielefeld Vbe-ls-.fehA City (pop., 2002 est: city, 323,400; metro, area, 579,000), northwestern Germany. Founded in 1214, the town arose from a religious settlement around St. Mary's Church in the late 13th century. It joined the Hanseatic League in the 14th century and passed to Brandenburg in 1647. The first mechanized textile mills in Germany were estab-

lished there in 1851. Heavily damaged in World War II, the city has since been rebuilt. It is the centre of a linen industry; it also has silk and plush weaving mills.

biennial Any plant that completes its life cycle in two growing seasons. During the first growing season biennials produce roots, stems, and leaves; during the second they produce flowers, fruits, and seeds, and then die. Sugar beets and carrots are examples of biennials. See also annual, PERENNIAL.

Bienville \bya n -'vel\, Jean-Baptiste Le Moyne de (baptized Feb. 23, 1680, Montreal, New France — d. March 7, 1767, Paris, France)

Nicholas Biddle

COURTESY OF THE LIBRARY OF CONGRESS, WASHINGTON, D.C.

French explorer, colonial governor of Louisiana, and founder of New Orleans. He served with the French navy in King William's War. He accompanied his brother Pierre Iberville on expeditions to the mouth of the Mississippi River. They founded a settlement in 1699, and he later commanded the colony of Louisiana (1701-12, 1717-23). He founded New Orleans in 1718 and made it the colony's capital in 1722. Recalled to France in 1723, he returned to serve as governor of Louisiana (1733-43).

Bierce, Ambrose (Gwinnett) (b. June 24, 1842, Meigs county, Ohio, U.S. — d. 1914, Mexico?) U.S. newspaperman, satirist, and short-story writer. Not long after serving in the Civil War, he became a newspaper columnist and editor in San Francisco, specializing in attacks on frauds of all sorts. Among his books are Tales of Soldiers and Civilians (1891; revised as In the Midst of Life), which includes "An Occurrence at Owl Creek Bridge"; Can Such Things Be? (1893); and The Devil's Dictionary (1906), a volume of ironic definitions. Tired of American life, he went in 1913 to Mexico, then in the middle of a revolution, and mysteriously disappeared, possibly killed in the 1914 siege of Ojinaga.

Bierstadt Vber-,shtat\, Albert (b. Jan. 7, 1830, near Diisseldorf, Westphalia — d. Feb. 19, 1902, New York, N.Y., U.S.) German-born U.S. painter of the Hudson River school. His parents immigrated to the U.S. when he was an infant. As a young man he traveled and sketched throughout Europe before returning to the U.S. to join a westward-bound expedition in 1859. Specializing in grandiose pictures of vast mountain scenery, he achieved great popularity in his lifetime with panoramic and often fanciful scenes of the American West, including The Rocky Mountains (1863) and Mount Corcoran (c. 1875-77). His huge paintings were actually executed in his New York City studio.

big bang Model of the origin of the universe, which holds that it emerged from a state of extremely high temperature and density in an explosive expansion 10 billion— 15 billion years ago. Its two basic assumptions — that Albert Einstein's general theory of relativity correctly describes the gravitational interaction of all matter and that an observer's view of the universe does not depend on direction of observation or on

location — make it possible to calculate physical conditions in the universe back to a very early time called the Planck time (after Max Planck). According to the model proposed by George Gamow in the 1940s, the universe expanded rapidly from a highly compressed early state, with a steady decrease in density and temperature. Within seconds, matter predominated over antimatter and certain nuclei formed. It took another million years before atoms could form and electromagnetic radiation could travel through space unimpeded. The abundances of hydrogen, helium, and lithium and the discovery of cosmic background radiation support the model, which also explains the redshifts of the light from distant galaxies as resulting from the expansion of space.

Big Ben Clock housed in the tower a of Parliament. Designed by Sir Edmund Beckett (1816-1905), Big Ben is famous for its accuracy and its 13-ton bell. The name (for Sir Benjamin Hall, commissioner of works at the time of its installation in 1859) originally applied only to the bell but eventually came to include the clock itself.

Big Bend National Park Preserve, southwestern Texas, U.S. It lies 250 mi (400 km) southeast of El Paso and occupies 1,252 sq mi (3,243 sq km). It was established in 1944 and named for the wide bend in the Rio Grande that skirts its southern edge. The park has magnificent mountain and desert scenery; it is home to more than 1,000 species of plants, and its wildlife includes coyotes, pumas, and roadrunners.

the eastern end of Britain’s Houses

i

in

Big Ben, London.

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Big Bertha Either of two different sets of long-range artillery produced by the Krupp works (see Thyssen Krupp Stahl) in Germany during World War I. The first were 420-mm (16.5-in.) howitzers used by German forces advancing through Belgium in 1914. The second were cannons specially built to bombard Paris in 1918. About 112 ft (34 m) long, they weighed

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200 tons (181 metric tons) and were 210 mm (8 in.) or more in calibre. The Paris guns were moved on railway tracks; they bombarded the city for 140 days. Their unprecedented range of 75 mi (121 km) was achieved by sending the shells on a trajectory 12 mi (19 km) into the stratosphere. They were nicknamed for the Krupp matriarch Bertha von Bohlen.

Big Cypress Swamp Swamp region whose eastern half is a national preserve, southern Florida, U.S. Covering 2,400 sq mi (6,200 sq km), the region merges with the swampy Everglades on the east and south. It is dominated by cypress trees, and wildlife is abundant. The Seminole Indians have reservations in the area.

Big Stick Policy Policy named by Pres. Theodore Roosevelt to describe the assertion of U.S. dominance as a moral imperative. It was taken from an African proverb, “Speak softly and carry a big stick; you will go far.” Roosevelt first used it when he asked Congress for money to increase U.S. naval preparedness to support his diplomatic objectives. The press used the phrase to describe Roosevelt’s Latin America policy and his domestic policy of regulating monopolies.

Big Sur Scenic region along the Pacific coast of California, U.S. It comprises a ruggedly beautiful stretch of seacoast 100 mi (160 km) long. Popular with tourists and naturalists, it extends southward from Carmel to the Hearst Castle at San Simeon. A narrow, mountainous coastal road affords views of the Pacific Ocean and the wilderness areas of the Los Padres National Forest. The Pfeiffer-Big Sur State Park contains the town of Big Sur and borders the Big Sur River. The home of Robinson Jeffers is a local landmark.

big tree or giant sequoia or Sierra redwood Coniferous evergreen (Sequoiadendron giganteum ; see conifer) found in scattered groves on the western slopes of the Sierra Nevada range of California, U.S. The largest of all trees in bulk, the big tree is distinguished from the coastal redwood (Sequoia sempervirens) by having uniformly scalelike, or awl-shaped, leaves that lie close against the branches, scaleless winter buds, and cones requiring two seasons to mature. The pyramidal tree shape, reddish brown furrowed bark, and drooping branches are common to both genera. The largest specimen (in total bulk) is the General Sherman tree in Sequoia National Park — 101.5 ft (31 m) in circumference at its base, 272.4 ft (83 m) tall, and weighing an estimated 6,167 tons (5,593 metric tons). Because big-tree lumber is more brittle than redwood lumber and thus less desirable, the big tree has been easier to preserve; though some groves have been cut, most of the 70 remaining groves are now protected by state or national forests or parks.

Bigfoot or Sasquatch Large, hairy, humanlike creature that report-

edly lives in isolated areas of the northwestern U.S. and western Canada. Descriptions of Bigfoot are similar to those of the Abominable Snowman of the Himalayas. It is said to be a primate 6-15 ft (2-4.5 m) in height, walking upright and either moving silently or emitting a high-pitched cry. Supposed footprints (some are hoaxes) have measured up to 24 in. (60 cm) in length. Despite many reported sightings, there is still no solid evidence that Bigfoot exists.

bighorn or mountain sheep Stocky, climbing hoofed mammal (Ovis canadensis) of western North America. Both sexes have horns that in the male may curve in a spiral more than 39 in. (1 m) long. Their fur is usually brown with a whitish rump patch. The related thinhom, or Dali's sheep (O . dalli), of Alaska and Canada is similar to the bighorn.

Both species are about 39 in. (1 m) tall at the shoulder, but the bighorn is heavier, weighing up to 300 lb (136 kg). They live in small groups among remote crags and cliffs of mountainous areas and feed mainly on grasses. Bighorn rams compete for females by launching themselves at each other from a few yards' distance and clashing horns.

Bighorn Mountains Mountain range, southern Montana and northern Wyoming, U.S. It is a range of the northern Rocky Mountains extending 120 mi (193 km), rising abruptly 4,000-5,000 ft (1,200-1,500 m) above

the Great Plains and Bighorn Basin. The highest summit is Wyoming's Cloud Peak, at 13,165 ft (4,013 m). Bighorn National Forest covers part of the range. On Medicine Mountain is the Medicine Wheel, a prehistoric stone-spoked circle 70 ft (20 m) in diameter.

Bighorn River River, Wyoming and Montana, U.S. Formed by the confluence of the Popo Agie and Wind rivers in west-central Wyoming, it flows north 336 mi (541 km) into the Yellowstone River in southeastern Montana. The Little Bighorn joins the main stream at Hardin, Mont. The Bighorn Canyon National Recreation Area stretches along the Montana-Wyoming border. See also Battle of the Little Bighorn.

Bihar \bi-'har\ State (pop., 2001: 82,998,509), northeastern India. Bordered by Nepal and West Bengal, Jharkhand, and Uttar Pradesh states, it occupies 38,301 sq mi (99,200 sq km); its capital is Patna. Its limits are nearly the same as those of the ancient kingdoms of Videha and Magadha. In the 4th century ad the area came under the Gupta empire, whose capital was at Pataliputra (Patna). Overcome by the Muslims c. 1200, Bihar was annexed to Delhi in 1497. Taken by the British in 1765, it was made part of Bengal. The area was the scene of revolts against the British in the mid- 19th century and of Mohandas K. Gandhi's nonviolent movement in the early 20th century. Bihar was made a province of British India in 1936; in 1950 it became a state in independent India. It is one of India's least urbanized states, and most of its population engages in agriculture. In

2000 the state of Jharkhand was created from Bihar's southern districts.

Bikini Atoll, western Marshall Islands, central Pacific Ocean. It consists of a ring of 20 small coral islands. Administered by the U.S. from 1947 as part of a UN-sanctioned U.S. Trust Territory of the Pacific Islands, it was used for U.S. nuclear- weapons testing in 1946-58. The 166 inhabitants were removed before the tests began and returned in 1969, but they were evacuated again in 1978 because of high radiation levels. Cleanup there continued, and in the late 1990s Bikini was again deemed safe for habitation. The atoll became part of the Republic of the Marshall Islands in 1979.

Biko Vbe-ko\, Stephen (b. Dec. 18, 1946, King William's Town, S.Af. — d. Sept. 12, 1977, Pretoria) South African political activist. A former medical student, in 1968 he founded the Black Consciousness movement, designed to raise black awareness of apartheid oppression. He was officially "banned" by the South African government in 1973 and was arrested several times in 1976-77. His death from head injuries suffered in police custody made him an international martyr for South African black nationalism. The initial inquest absolved the police of wrongdoing, but in 1997 five former officers confessed to Biko's murder.

Bilbao Vbil-'ba-.o, bil-'bau\ Port city (pop., 2001: city, 349,972; metro, area, 947,334), northern Spain. It is located 7 mi (11 km) inland from the Bay of Biscay. The largest city in the Basque Country, it originated as a settlement of mariners and ironworkers and was chartered in 1300. In the 18th century it prospered through trade with Spain's New World colonies. The city was sacked by French troops in the Peninsular War (1808) and besieged during the Carlist Wars (see Carlism). It is a chief port in Spain and a centre of the metallurgical industries, shipbuilding, and banking. Landmarks include the 14th-century Cathedral of Santiago and the 20th-century Guggenheim Museum Bilbao.

bilberry Low-growing deciduous shrub (Vaccinium myrtillus) of the heath family, found in woods and on heaths, chiefly in hilly districts of Britain, northern Europe, and Asia. The stiff stems bear small egg-shaped leaves and small rosy flowers tinged with green. The dark blue, waxy berries are an important food of the grouse and are used for tarts and preserves. They are borne singly, unlike those of the much more productive cultivated blueberries of the U.S. (V. australe), which are borne in long clusters.

bildungsroman \'bil- l duqz-ro-,man\ German "novel of character development" Class of novel in German and other literature that deals with the formative years of the main character, whose moral and psychological development is depicted. It ends on a positive note, with the hero's foolish mistakes and painful disappointments behind him and a life of usefulness ahead. It grew out of folklore tales in which a dunce goes out into the world seeking adventure. The first novelistic development of the theme, Johann W. von Goethe's Wilhelm Meister's Apprenticeship (1795—96), remains a classic example.

bile Greenish-yellow liver secretion passed to the gallbladder for concentration, storage, or transport into the duodenum for fat digestion. Bile

Canadian bighorn sheep (Ovis

canadensis)

HARRY ENGELS-THE NATIONAL AUDUBON SOCIETY
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contains bile acids and salts, cholesterol, and electrolyte chemicals that keep it slightly acidic. In the intestine, products of the acids and salts emulsify fat and reduce its surface tension to prepare it for the action of pancreatic and intestinal fat-splitting enzymes.

bilingualism Ability to speak two languages. It may be acquired early by children in regions where most adults speak two languages (e.g., French and dialectal German in Alsace). Children may also become bilingual by learning languages in two different social settings; for example, British children in British India learned an Indian language from their nurses and family servants. A second language can also be acquired in school. Bilingualism can also refer to the use of two languages in teaching, especially to foster learning in students trying to learn a new language. Advocates of bilingual education in the U.S. argue that it speeds learning in all subjects for children who speak a foreign language at home and prevents them from being marginalized in English-language schools. Detractors counter that it hinders such children from mastering the language of the larger society and limits their opportunities for employment and higher education.

bill See beak

Bill, Max (b. Dec. 22, 1908, Winterthur, Switz. — d. Dec. 9, 1994, Berlin, Ger.) Swiss painter, sculptor, graphic artist, and industrial designer. He studied architecture, metalwork, stage design, and painting at the Bauhaus. In 1930 he opened his own studio in Zurich, where he spent most of his life and earned a living designing advertisements. In the 1940s he designed chairs featuring geometric forms. He cofounded and directed the College of Design in Ulm, Ger. (1951-55), and also designed its buildings. He is best known for his advertising designs.

bill of exchange Short-term negotiable financial instrument consisting of a written order addressed by the seller of goods to the buyer requiring the latter to pay a certain sum of money on demand or at a future time. Bills of exchange are often used in international transactions, and the holder of such a bill may redeem it in cash immediately by selling it to a bank at a discount. Bills of exchange used in domestic transactions are sometimes called drafts. See also promissory note.

Bill of Rights (1689) British law, one of the basic instruments of the British constitution. It incorporated the provisions of the Declaration of Rights, which William III and Mary II accepted upon taking the throne. Its

main purpose was to declare illegal various practices of James II, such as the royal prerogative of dispensing with the law in certain cases. The result of a long struggle between the Stuart kings and the English people and Parliament, it made the monarchy clearly conditional on the will of Parliament and provided freedom from arbitrary government. It also dealt with the succession to the throne.

Bill of Rights First 10 amendments to the Constitution of the United States, adopted as a group in 1791. They are a collection of guarantees of individual rights and of limitations on federal and state governments that derived from popular dissatisfaction with the limited guarantees of the Constitution. The first Congress submitted 12 amendments (drafted by James Madison) to the states, 10 of which were ratified. The 1st Amendment guarantees freedom of religion, speech, and the press and grants the right to petition for redress and to assemble peacefully. The 2nd Amendment guarantees the right of the people to keep and bear arms. The 3rd prohibits the quartering of soldiers in private dwellings in peacetime. The 4th protects against unreasonable search and seizure. The 5th establishes grand-jury indictment for serious offenses, protects against double jeopardy in criminal cases, and prohibits compelling testimony by a person against himself. The 6th establishes the rights of the accused to a speedy trial and an impartial jury and guarantees the right to legal counsel and to the obtaining of witnesses in his favour. The 7th preserves the right to trial by jury in serious civil suits and prohibits double jeopardy in civil cases. The 8th prohibits excessive bail and cruel and unusual punishment. The 9th states that enumeration of certain rights in the Constitution does not mean the abrogation of rights not mentioned. The 10th reserves to the states and people any powers not delegated to the federal government.

billfish Any of several long-jawed fishes, especially those in the family Istiophoridae, including marlins, spearfishes, and SAiLFiSHes. The name is also applied to the gar, needlefish, and sauries (family Scomberesocidae), as well as to the swordfish (family Xiphiidae).

billiards Any of various games played on a cloth-topped, cushion-railed rectangular table by driving small, hard balls against one another or into

pockets with a long stick called a cue. Carom, or French billiards, is played with three balls, two white and one red, on a table without pockets. The object is to stroke the white cue ball so that it hits the two object balls in succession, scoring a carom (one point). English billiards is also played with three balls but on a pocketed table; it is scored in various ways. Snooker is another popular British billiards game. The principal billiards game in North America is pocket billiards, or pool. The Billiard Congress of America controls U.S. tournament play, including the U.S. Open Pockets Billiard Championship, regarded as the world championship.

Billings City (pop., 2000: 89,847), south-central Montana, U.S. Originally settled on the Yellowstone River in 1877 as Coulson, Billings was renamed in 1882 in honour of Frederick Billings, president of the Northern Pacific Railway Company. It is now a trading and shipping point for wool, livestock, and agriculture. Nearby Pictograph Cave State Monument has prehistoric artifacts.

Billings, John Shaw (b. April 12, 1838, Switzerland county, Ind., U.S. — d. March 11, 1913, New York, N.Y.) U.S. surgeon and librarian. He worked for the U.S. Army 1861-95. He fostered the growth of the

surgeon general's library in Washington, D.C., developing what would become the National Library of Medicine, the world's largest medical reference centre. He founded the monthly Index Medicus (1879), still one of the primary U.S. medical bibliographies, and published the first Index Catalogue (1880-95). He also designed Johns Hopkins Hospital and was its medical adviser, ran national vital statistics programs, led the U.S. effort to end yellow fever, and was the first director of the New York Public Library. His organization of U.S. medical institutions was central to modernization of hospital care and maintenance of public health.

Billings, William (b. Oct. 7, 1746, Boston, Mass. — d. Sept. 26, 1800, Boston, Mass., U.S.) American hymn composer, sometimes called the first American composer. A tanner by trade, he was largely self-taught in music. His robust and primitive style, lacking instrumental parts, has seemed to embody the distinctive virtues of early America. His New England Psalm-Singer {111 0) was the first published collection of American music; his other works include The Singing Master's Assistant (1778) and The Continental Harmony (1794).

Billiton \be-'le-,ton\ or Belitung \ba- , le-,tuq\ Island, Bangka-Belitung province, west-central Indonesia. Lying on the Karimata Strait between the islands of Bangka (west) and Borneo (northeast), it is situated between the South China Sea (north) and Java Sea (south). It is some 55 mi (90 km) long and 45 mi (70 km) wide, with an area of about 1,850 sq mi (4,800 sq km). The main town and port is Tanjungpandan. Billiton was ceded to the British in 1812 by the sultan of Palembang, Sumatra, but Britain recognized the Dutch claim in 1824. The island became part of Indonesia after World War II. It is important for its tin mines, discovered in 1851.

Billroth Vbil-rot\, (Christian Albert) Theodor (b. April 26, 1829, Bergen auf Riigen, Prussia — d. Feb. 6, 1 894, Abbazia, Austria-Hungary) Austrian surgeon. He pioneered the study of bacterial causes of wound fever and adopted early the antiseptic techniques that eradicated the threat of fatal surgical infections. The founder of modem surgery of the abdominal cavity, he altered and removed organs previously considered inaccessible. In 1872 he was the first to remove part of an esophagus, joining the ends together; later he performed the first complete larynx removal. In 1881, when he had made intestinal surgery almost commonplace, he successfully removed a cancerous pylorus (lower end of the stomach).

Billy the Kid orig. William H. Bonney, Jr., or Henry McCarty

(b. Nov. 23, 1859/60, New York, N.Y., U.S.— d. July 14, 1881, Fort Sumner, N.M.) U.S. criminal. As a child he migrated with his family to Kansas, then lived in New Mexico from c. 1868. His career of lawlessness throughout the Southwest began early; by the time he was captured by Sheriff Pat Garrett in 1880 he had allegedly killed 27 men. Convicted in New Mexico in 1881 and sentenced to hang, he escaped from jail, killing two deputies, and remained at large until Garrett tracked him down and killed him.

Biloxi \bi-'l3k-se, bi-'lak-se\ Coastal city (pop., 2000: 50,644), southeastern Mississippi, U.S. Located east of Gulfport on the Gulf of Mexico, it was first settled as Fort Louis (established 1719); a nearby earlier fort, Fort Maurepas, was the lower Mississippi valley's first permanent European settlement (1699). Biloxi has been under the flags of France, Spain, Britain, the West Florida Republic, and the Confederacy. By the late 20th

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century, casino gambling had become its chief industry, augmented by fishing and seafood processing. Beauvoir, Jefferson Davis's last home, is nearby. Biloxi has been subject to periodic devastating tropical cyclones, notably Hurricanes Camille (1969) and Katrina (2005).

Bilqis See Queen of Sheba

bimetallism Monetary standard or system based on the use of two metals, traditionally gold and silver, rather than one (monometallism). In the 19th century, a bimetallic system defined a nation's monetary unit by law in terms of fixed quantities of gold and silver (thus automatically establishing a rate of exchange between the two metals). The system provided a free and unlimited market for the two metals, imposed no restrictions on the use and coinage of either metal, and made all other money in circulation redeemable in either gold or silver. Because each nation independently set its own rate of exchange between the two metals, the resulting rates of exchange often differed widely from country to country. When the ratio of the official prices proved different from the ratio of prices in the open market, Gresham's law operated in such a way that coins of only one metal remained in circulation. A monometallic system using the gold standard proved more responsive to changes in supply and demand and was widely adopted after 1867. See also exchange rate; silver standard.

bin Laden, Osama (b. 1957, Riyadh, Saud.Ar.) Leader of a broad-based Islamic extremist movement implicated in numerous acts of terrorism against the U.S. and other Western countries. The son of a wealthy Saudi family, he joined the Muslim resistance in Afghanistan after the 1979 Soviet invasion of that country. Following his homecoming, he became enraged at the presence of U.S. troops in Saudi Arabia during the Persian Gulf War (1990-91) and, through a network of like-minded Islamic militants known as al-Qaeda, launched a series of terrorist attacks. These acts included the bombings of the World Trade Center in New York City in 1993, the U.S. embassies in Kenya and Tanzania in 1998, and the U.S. warship Cole in Aden, Yemen, in 2000. A self-styled Islamic scholar, bin Laden issued several legal opinions calling on Muslims to take up jihad (holy war) against the U.S., and in 2001 a group of militants under his direction launched the September 1 1 attacks, which led to the deaths of some 3,000 people. The U.S. thereafter demanded bin Laden's extradition from Afghanistan, where he was sheltered by that country's Taliban militia, and launched attacks on Taliban and al-Qaeda forces when that ultimatum was not met. With the collapse of the Taliban, bin Laden and his associates went into hiding.

binary code Code used in digital computers, based on a binary number system in which there are only two possible states, off and on, usually symbolized by 0 and 1. Whereas in a decimal system, which employs 10 digits, each digit position represents a power of 10 (100, 1,000, etc.), in a binary system each digit position represents a power of 2 (4, 8, 16, etc.).

A binary code signal is a series of electrical pulses that represent numbers, characters, and operations to be performed. A device called a clock sends out regular pulses, and components such as transistors switch on (1) or off (0) to pass or block the pulses. In binary code, each decimal number (0-9) is represented by a set of four binary digits, or bits. The four fundamental arithmetic operations (addition, subtraction, multiplication, and division) can all be reduced to combinations of fundamental Boolean algebraic operations (see Boolean algebra) on binary numbers.

binary star Pair of stars in orbit around a common centre of gravity. Their relative sizes and brightnesses and the distance between them vary widely. Perhaps half of all stars in the Milky Way Galaxy are binaries or members of more complex multiple systems. Some binaries form a class of variable stars (see eclipsing variable star). Stars can be identified as binaries in various ways — visually by telescope, through spectroscopic observation, by changes in apparent brightness (when the dimmer star eclipses its companion), or by changes in the proper motion of the visible member (owing to the gravitational pull of the invisible companion).

binding energy Energy required to separate a particle from a system of particles or to disperse all the particles of a system. Nuclear binding energy is the energy required to separate an atomic nucleus into its constituent protons and neutrons. It is also the energy that would be released by combining individual protons and neutrons into a single nucleus. Electron binding energy, or ionization potential, is the energy required to remove an electron from an atom, molecule, or ion, and also the energy released when an electron joins an atom, molecule, or ion. The binding energy of a single proton or neutron in a nucleus is about a million times greater than that of a single electron in an atom.

bindweed Any plant of the closely related genera Convolvulus and Calystegia , mostly twining, often weedy, and producing funnel-shaped flowers. Bellbine, or greater bindweed (Calystegia sepium), native in Eurasia and North America, is a twining perennial that grows from creeping, underground stems and is common in hedges and woods and along roadsides. Sea bindweed (C. soldanella) creeps along European seaside sand and gravel. Several Convolvulus species are widespread or conspicuous. The weedy perennial field bindweed (C. arvensis), European but widely naturalized in North America, twines around crop plants and along roadsides. Scammony, a purgative, is derived from the rhizomes of C. scammonia, a trailing perennial native to western Asia. Rosewood oil comes from certain species of Convolvulus.

Binet \bi-’na\, Alfred (b. July 8, 1857, Nice, France — d. Oct. 18, 1911, Paris) French psychologist. His interest in Jean-Martin Charcot’s work on hypnosis prompted him to abandon a law career and study medicine at the Salpetriere Hospital in Paris (1878-91). He served as director of a research laboratory at the Sorbonne (1895-1911). A major figure in the development of experimental psychology in France, he founded L Annee Psychologique, the first French journal on psychology, in 1895. He developed experimental techniques to measure reasoning ability; between 1905 and 1911 he and Theodore Simon developed influential scales for the measurement of intelligence of children. His works include Experimental Study of Intelligence (1903) and A Method of Measuring the Development of the Intelligence of Young Children (1915).

Binford, Lewis R(oberts) (b. Nov. 21, 1930, Norfolk, Va„ U.S.) U.S.

archaeologist. Binford taught principally at the University of New Mexico. In the mid 1960s he initiated what came to be known as the “New Archaeology,” which champions the use of quantitative methods and the practice of archaeology as a rigorous science. He applied the new methodology in an influential study of Mousterian artifacts and later extended it to a study of the hunting activities of a living people, the Nunamiut, trying to draw analogies to prehistoric contexts.

Bing, Sir Rudolf (b. Jan. 9, 1902, Vienna, Austria-Hungary — d. Sept. 2, 1997, New York, N.Y., U.S.) Austrian-born British opera impresario. After holding positions in German opera houses, he assumed the position of general manager at the Glyndebourne Opera in England (1935 — 49). In 1946 he helped found the Edinburgh Festival. From 1950 until 1972 he served as general manager of the Metropolitan Opera, where, wielding autocratic power, he raised the institution’s performance standards, extended its season, encouraged innovations in design and production, ended the exclusion of black singers, and oversaw the company’s move to Lincoln Center in 1966.

Bingham, George Caleb (b. March 20, 1811, Augusta county, Va., U.S. — d. July 7, 1879, Kansas City, Mo.) U.S. painter and frontier politician. He studied briefly at the Pennsylvania Academy of the Fine Arts,

Fur Traders Descending the Missouri, oil on canvas by George Caleb Bingham, 1 845; in the Metropolitan Museum of Art, New York City.

COURTESY OF THE METROPOLITAN MUSEUM OF ART, NEW VORK, MORRIS K. JESUP FUND, 1 933

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but he was largely self-taught. He entered politics in Missouri and worked as an itinerant portrait painter before turning to the lively routines of frontier life for inspiration. Bingham is known for his incisive characterizations, clear, golden light, and talent for organizing large, dense compositions. His best-known works include Fur Traders Descending the Missouri (1845) and Jolly Flatboatmen (1846).

bingo Game of chance played with cards having a grid of numbered squares corresponding to numbered balls drawn at random. When a number on the card is drawn, the players cover that number (should they have it); the game is won by covering a certain number of squares in a row (vertically, horizontally, or diagonally). Cards are purchased and proceeds are placed into a common “pot”; winning cards are awarded a portion of the pot. Wildly popular in the mid 20th century, bingo has in recent decades suffered a decline in America but has increased in popularity in other parts of the world. The earliest name for bingo — lotto — was recorded in Britain in 1776; the game is sometimes called keno in the U.S.

Binh Dinh Vuong See Le Loi

binoculars Optical instrument for providing a magnified view of distant objects, consisting of two similar telescopes, one for each eye, mounted on a single frame. In most binoculars, each telescope has two prisms, which reinvert the inverted image provided by the eyepiece of each telescope. Light rays travel along a folded path inside the telescopes, so the instrument has a shorter overall length. The prisms also provide better depth perception at greater distances, by allowing the two objectives (object lenses) to be set farther apart than the eyepieces. Binocular eyepieces are often fitted to microscopes or other optical instruments.

binomial nomenclature System of naming organisms in which each organism is indicated by two words, the genus (capitalized) and species (lowercase) names, both written in italics. For example, the tea rose is Rosa odorata ; the common horse is Equus caballus. The system was developed by Carolus Linnaeus in the mid 18th century. The number of binomial names proliferated as new species were established and more categories were formed, and by the late 19th century the nomenclature of many groups of organisms was confused. International committees in the fields of zoology, botany, bacteriology, and virology have since established rules to clarify the situation. See also taxonomy.

binomial theorem In algebra, a formula for expansion of the binomial (x + y) raised to any positive integer power. A simple case is the expansion of (x + y) 2 , which is x 2 + 2xy + y 2 . In general, the expression (x + y) n expands to the sum of (n + l)terms in which the power of x decreases from n to 0 while the power of y increases from 0 to n in successive terms. The terms can be represented in factorial notation by the expression [n\/((n - r)!r!)]x” - r y r in which r takes on integer values from 0 to n.

Bio-Bio \,be-6-'be-6\ River River, south-central Chile. Rising in the Andes Mountains, it flows northwestward 240 mi (380 km) to enter the Pacific Ocean near Concepcion. Though it is one of Chile’s longest rivers, it is shallow and navigable only by flat-bottomed boats.

biochemistry Field of science concerned with chemical substances and processes that occur in plants, animals, and microorganisms. It involves the quantitative determination and structural analysis of the organic compounds that make up cells (proteins, carbohydrates, and lipids) and of those that play key roles in chemical reactions vital to life (e.g., nucleic acids, vitamins, and hormones). Biochemists study cells’ many complex and interrelated chemical changes. Examples include the chemical reactions by which proteins and all their precursors are synthesized, food is converted to energy (see metabolism), hereditary characteristics are transmitted (see heredity), energy is stored and released, and all biological chemical reactions are catalyzed (see catalysis, enzyme). Biochemistry straddles the biological and physical sciences and uses many techniques common in medicine and physiology as well as those of organic, analytical, and physical chemistry.

biochip Small-scale device, analogous to an integrated circuit, constructed of or used to analyze organic molecules associated with living organisms. One type of theoretical biochip is a small device constructed of large organic molecules, such as proteins, and capable of performing the functions (data storage, processing) of an electronic computer. The other type of biochip is a small device capable of performing rapid, small-scale

biochemical reactions for the purpose of identifying gene sequences, environmental pollutants, airborne toxins, or other biochemical constituents.

biodegradability Capacity of a material to decompose by biological action. The term usually refers to the environmental breakdown of waste by microorganisms. Generally, plant and animal products are biodegradable, whereas mineral substances (e.g., metals, glass, plastics) are not. Local conditions, especially the presence or absence of oxygen, affect biodegradability. Disposal of nonbiodegradable waste is a primary source of pollution. Surgical materials made to be absorbed by the body are also called biodegradable.

biodiversity Quantity of plant and animal species found in a given environment. Sometimes habitat diversity (the variety of places where organisms live) and genetic diversity (the variety of traits expressed within a species) are also considered types of biodiversity. The estimated 3-30 million species on Earth are divided unequally among the world's habitats, with 50-90% of the world's species living in tropical regions. The more diverse a habitat, the better chance it has of surviving a change or threat to it, because it is more likely to be able to make a balancing adjustment. Habitats with little biodiversity (e.g., Arctic tundra) are more vulnerable to change. The 1992 Earth Summit resulted in a treaty for the preservation of biodiversity.

bioengineering Application of engineering principles and equipment to biology and medicine. It includes the development and fabrication of life-support systems for underwater and space exploration, devices for medical treatment (see dialysis, prosthesis), and instruments for monitoring biological processes. Development has been particularly rapid in the area of artificial organs, which culminated in the implantation of an artificial heart into a human being in 1982. Bioengineers also develop equipment that enables humans to maintain body functions in hostile environments, such as the space suits worn by astronauts during extravehicular maneuvers.

biofeedback Information supplied instantaneously about an individual's own physiological processes. Data concerning cardiovascular activity (blood pressure and heart rate), temperature, brain waves, or muscle tension is monitored electronically and returned or "fed back" to the individual through a gauge on a meter, a light, or a sound. The goal is for the patient to use that biological data to learn to voluntarily control the body's reactions to stressful external events. A type of behaviour therapy, biofeedback training is sometimes used in combination with psychotherapy to help patients understand and change their habitual reactions to stress. Complaints treated through biofeedback include migraine headaches, gastrointestinal problems, high blood pressure, and epileptic seizures.

biography Form of nonfictional literature whose subject is the life of an individual. The earliest biographical writings probably were funeral speeches and inscriptions. The origins of modern biography lie with Plutarch's moralizing lives of prominent Greeks and Romans and Suetonius's gossipy lives of the Caesars. Few biographies of common individuals were written until the 16th century. The major developments of English biography came in the 18th century, with such works as James Boswell's Life of Johnson. In modern times impatience with Victorian reticence and the development of psychoanalysis have sometimes led to a more penetrating and comprehensive understanding of biographical subjects. See

also AUTOBIOGRAPHY.

Bioko \be-'o-ko\ formerly Fernando Po \fer-'nan-do-'po\ Island (pop., 1987 est.: 67,920), Bight of Biafra, West Africa. It lies 100 mi (160 km) northwest of continental Equatorial Guinea, of which it is a part. Bioko became the official name in 1979. Volcanic in origin, with an area of 779 sq mi (2,018 sq km), it rises sharply from the sea; its highest point is Santa Isabel Peak, at 9,869 ft (3,008 m). Malabo, the country's capital, is located on Bioko. The island was visited by the Portuguese explorer Fernao Po, probably in 1472. Though the island was claimed by Spain after 1778, the first attempt at firm Spanish control came only in 1858. The original inhabitants, the Bubi, are descendants of Bantu-speaking migrants from the mainland. Many Fang have flocked to the island from the continent.

biological rhythm Periodic biological fluctuation in an organism corresponding to and in response to periodic environmental change, such as day and night or high and low tide. The internal mechanism that maintains this rhythm even without the apparent environmental stimulus is a "biological clock." When the rhythm is interrupted, the clock's adjustment is delayed, accounting for such phenomena as jet lag when traveling across time zones. Rhythms may have 24-hour (circadian rhythm), monthly, or annual cycles. See also photoperiodism.

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biological warfare or germ warfare Military use of disease-producing or poisonous agents, and the means for defending against such agents. Biological warfare agents include many bacteria, such as those which cause anthrax, brucellosis, and typhus; viruses that cause diseases such as equine encephalitis; fungi such as rice blast, cereal rust, wheat smut, and potato blight; and toxins such as botulinum and ricin that are extracted from living organisms. Biological warfare dates from ancient times when warring groups would try to poison enemy soldiers with rotting or diseased corpses, infect cattle and horses, or spread contagion through civilian populations. Following the horrors of World War I, a 1925 Geneva Protocol prohibited the use of biological agents in warfare; however, this did not prevent Japan from using them in China during World War II. During the Cold War the Soviet Union as well as the U.S. and its allies built huge stockpiles of biological agents. Both sides signed the 1972 Biological Weapons Convention, which prohibits the production, stockpiling, or development of biological weapons and requires the destruction of existing stockpiles, but the Soviets conducted a clandestine program until the 1990s. Biological weapons programs can be concealed easily, and the 1972 convention contains no provisions for inspection and reporting. As a result, many states have been suspected of developing biological warfare agents, and some modern armed forces have prepared defensive measures. These include battlefield sensors, protective garments and masks, sterilizing agents, and vaccines.

biology Study of living things and their vital processes. An extremely

broad subject, biology is divided into branches. The current approach is based on the levels of biological organization involved (e.g., molecules, cells, individuals, populations) and on the specific topic under investigation (e.g., structure and function, growth and development). According to this scheme, biology's main subdivisions include morphology, physiology, taxonomy, embryology, genetics, and ecology, each of which can be further subdivided. Alternatively, biology can be divided into fields especially concerned with one type of living thing; for example, botany (plants), zoology (animals), ornithology (birds), entomology (insects), mycology (fungi), microbiology (microorganisms), and bacteriology (bacteria). See also biochemistry; molecular biology.

biology, philosophy of Philosophical investigation of the concepts, problems, and methods of the biological sciences. Many of the topics considered in contemporary philosophy of biology have arisen from reflection on aspects of the theory of evolution. They include the question of whether evolution is ultimately falsifiable, a conventional requirement of all scientific theories; whether the thesis of natural selection has empirical content or is merely a tautology; whether selection operates at the level of the individual, the species, or the gene; and whether selection is guided by certain constraints controlling development at the molecular level. Other more general issues concern the possible reduction of biological theories to theories of the physical sciences, the role of teleological language in biology (see teleology), and the nature of species as a biological category. See also creationism; sociobiology.

bioluminescence \ l bI-o- l lu-m3-'ne-s 3 ns\ Emission of light by an organism or biochemical system (e.g., the glow of bacteria on decaying meat or fish, the phosphorescence of protozoans in tropical seas, the flickering signals of fireflies). It occurs in a wide range of protists and animals, including bacteria and fungi, insects, marine invertebrates, and fish. It is not known to exist naturally in true plants or in amphibians, reptiles, birds, or mammals. It results from a chemical reaction that produces radiant energy very efficiently, giving off very little heat. The essential light-emitting components are usually the organic molecule luciferin and the enzyme luciferase, which are specific for different organisms. In higher organisms, light production is used to frighten predators and to help members of a species recognize each other. Its functional role in lower organisms such as bacteria, dinoflagellates, and fungi is uncertain. Luminous species are widely scattered taxonomically, with no clear-cut pattern, though most are marine.

biomass Weight or total quantity of living organisms of one animal or plant species (species biomass) or of all the species in the community (community biomass), commonly referred to as a unit area or volume of the habitat. The biomass in an area at a given moment is the standing crop.

biome Vbl-.omX Largest geographic biotic unit, a major community of plants and animals with similar requirements of environmental conditions. It includes various communities and developmental stages of communities and is named for the dominant type of vegetation, such as grassland or coniferous forest. Several similar biomes constitute a biome type; for example, the temperate deciduous forest biome type includes the deciduous forest biomes of Asia, Europe, and North America. The standard European term for biome is "major life zone."

Biondi \be-'an-de\, Matt (b. Oct. 15, 1965, Palo Alto, Calif., U.S.) U.S. swimmer. Biondi, 6 ft 7 in. (2 m) tall, won 11 medals, including eight gold medals, in three consecutive Olympic Games (1984, 1988, and 1992). Along with Mark Spitz, he is the most successful U.S. swimmer in Olympic history.

biophysics Discipline concerned with applications of the principles and methods of the physical sciences to biological problems. Biophysics deals with biological functions that depend on physical agents such as electricity or mechanical force, with the interaction of living organisms with physical agents such as light, sound, or ionizing radiation, and with interactions between living things and their environment as in locomotion, navigation, and communication. Its subjects include bone, nerve impulses, muscle, and vision as well as organic molecules, using such tools as paper chromatography and X-ray crystallography.

biopsy \'bI-,ap-se\ Procedure in which cells or tissues are removed from a patient and examined. The sample may be obtained from any organ, by any of several methods, including suction through a needle, swabbing, scraping, endoscopy, and cutting out the entire structure or part of it to be tested. Biopsy is a standard step in distinguishing malignant from benign tumours and can provide other information for diagnosis, particularly concerning such organs as the liver or pancreas. Slides of the tissue are prepared and examined by microscope.

BIOS \'bI-,os\ in full Basic Input/Output System Computer program that is typically stored in EPROM and used by the CPU to perform start-up procedures when the computer is turned on. Its two major procedures are determining what peripheral devices (keyboard, mouse, disk drives, printers, video cards, etc.) are available and loading the operating system (OS) into main memory. After start-up, the BIOS program manages data flow between the OS and the peripherals, so neither the OS nor the application programs need to know the details of the peripherals (such as hardware addresses).

biosolids Sewage sludge, the residues remaining from the treatment of sewage. For use as a fertilizer in agricultural applications, biosolids must first be stabilized through processing, such as digestion or the addition of lime, to reduce concentrations of heavy metals and harmful organisms (certain bacteria, viRUSes, and other pathogens). This processing also reduces the volume of material and stabilizes the organic matter in it, thus reducing the potential for odours. Use of biosolids in agriculture has become controversial, critics claiming that even treated sewage may harbour harmful bacteria, viruses, and heavy metals.

biosphere Relatively thin life-supporting stratum of the earth’s surface, extending from a few miles into the atmosphere to the deep-sea vents of the oceans. The biosphere is a global ecosystem that can be broken down into regional or local ecosystems, or biomes. Organisms in the biosphere are classified into trophic levels (see food chain) and communities.

biotechnology Application to industry of advances made in the biological sciences. The growth of the field is linked to the development in the 1970s of genetic engineering and to the 1980 U.S. Supreme Court decision that “a live human-made microorganism is a patentable matter,” which resulted in the establishment of numerous commercial biotechnology firms that manufacture genetically engineered substances for a vari-

ety of mostly medical, agricultural, and ecological uses.

biotin \'bI-3-ton\ Organic compound, part of the vitamin B complex, essential for growth and well-being in animals and some microorganisms. A carboxylic acid with two rings in its structure, it includes nitrogen and sulfur atoms as well as carbon, hydrogen, and oxygen. It functions in the formation and metabolism of fats and carbohydrates. It is widely distributed in nature and is especially abundant in egg yolk, beef liver, and yeast. A biotin deficiency can be induced by consuming large amounts of raw egg white, which contains a protein (avidin) that combines with biotin and makes it unavailable. Biotin is needed to synthesize fatty acids and convert amino acids to glucose in the body.

biotite or black mica Silicate mineral in the common mica group. It is abundant in metamorphic rocks, in pegmatites, and in granites and other

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igneous rocks. Biotite is a layer silicate structure in which aluminum and silicon occur in infinitely extending Si-Al-0 sheets that alternate with potassium-rich and magnesium- (and iron-) containing sheets.

Bioy Casares Vbe-'oi-ka-'sa-rasV Adolfo (b. Sept. 15, 1914, Buenos Aires, Arg. — d. March 8, 1999, Buenos Aires) Argentine writer and editor. He is known for his use of magic realism both in his own works and in collaborations with Jorge Luis Borges.

Among his novels are The Invention of Morel (1940), The Dream of Heroes (1954), and Diary of the War of the Pig (1969). In 1990 he received the Cervantes Prize, the highest honour in Hispanic letters.

bipolar disorder or manic-depressive psychosis Mental illness characterized by the alternation of manic and depressive states. Depression is the more common symptom, and many patients experience only a brief period of overoptimism and mild euphoria during the manic phase. The condition, which seems to be inheritable, probably arises from malregulation of the amines norepinephrine, dopamine, and 5-hydroxytryptamine. It is most commonly treated with lithium carbonate.

Biqa' \be-'ka\, Al- or Bekaa \be-'ka\ Valley ancient Coele-Syria

Broad valley region of central Lebanon. Located between the Lebanon and Anti-Lebanon mountain ranges, it is about 75 mi (120 km) long and 10

mi (15 km) wide. Traversed by the upper Orontes and Litani rivers, the valley is an agricultural area. The ruins of the ancient city of Baalbeck are located there. The majority of the inhabitants are Shfite Muslims. The region was the scene of some factional fighting during the Lebanese Civil War (1975-90), and during that time Israel intermittently fought there against forces of the Palestine Liberation Organization and the Syrian army. Since the 1980s the region has been a stronghold of the Shl'ite militant organization Hezbollah.

birch Any of about 40 species of short-lived ornamental and timber trees and shrubs of the genus Betula, the largest genus of the family Betulaceae, which also contains alders, filberts, Carpinus (hornbeam), and the genera Ostrya and Ostryopsis. Birches are found throughout cool regions of the Northern Hemisphere; other members of the family Betulaceae are found in temperate and subarctic areas of the Northern Hemisphere, in tropical mountains, and in South America through the Andes as far south as Argentina. Leaves are simple, serrate, and alternate; male and female flowers (catkins) are borne on the same plant. The fruit is a small nut or short-winged samara (dry, winged fruit). Birches produce economically important timber. Oil obtained from birch twigs smells and tastes like wintergreen and is used in tanning Russian leather (see tanning).

bird Any of the warm-blooded, beaked vertebrates of the class Aves, including more than 9,600 living species. A covering of feathers distin-

co verts

hind toe
(hallux)

forehead _

upper

mandible

chin
lores
throat
breast
— side
abdomen
flank
tarsus

auricular (ear patch)
nape
side of neck

bend of wing

back

scapulars —
wing coverts

secondaries

tail feathers
(rectrices)

Principal features of a songbird.

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guishes birds from all other animals. Birds have a four-chambered heart (like mammals), forelimbs modified into wings, and keen vision, and their eggs have calcium-rich eggshells. Their sense of smell is not highly developed. Birds are found almost worldwide in diverse habitats on both land and water. Dietary preferences and nest structure vary widely. Almost all species incubate their eggs. Flying birds have evolved skeletons in which part of the bone is replaced by air spaces, an adaptation for reducing weight. The crop, an enlarged part of the esophagus used for temporary food storage, enables birds to feed while in flight. Humans use wild and domesticated birds and their eggs for food, hunt wild birds for sport, and use feathers for decoration and insulation. More than 1,000 extinct species of bird have been identified from fossil remains; the earliest fossil bird known is Archaeopteryx.

Bird, Larry (Joe) (b. Dec. 7, 1956, West Baden, Ind., U.S.) U.S. basketball player. Bird spent most of his collegiate career at Indiana State University, before being drafted by the Boston Celtics of the National Basketball Association (NBA). Playing forward and standing 6 ft 9 in. (2.06 m) tall, he was a great shooter and ball handler and one of the most formidable playmakers in the game. He helped lead Boston to NBA championships in 1981, 1984, and 1986 and was named the NBA’s most valuable player for three consecutive years (1984-86). He retired in 1992 and was head coach of the Indiana Pacers for the 1997-98 season.

bird flu or avian influenza viral respiratory disease, mainly of birds including poultry and waterbirds but also transmissible to humans. Symptoms in humans include fever, sore throat, cough, headache, and muscle aches. Severe infections can result in life-threatening complications such as pneumonia and acute respiratory illness. The first known human cases occurred in Hong Kong in 1997, resulting in six deaths. Deadly outbreaks among poultry in several countries in eastern and central Asia between 2003 and mid-2005 were accompanied by more than 100 human cases, about half of them fatal. The causative agents are virus subtypes related to the human influenza type A viruses, the most virulent and contagious being the H5N1 subtype. A specific protective vaccine for this virus remains to be developed. Studies suggest that some antiviral drugs that work against human influenza may be effective in treating bird flu in humans.

bird-of-paradise Any of about 40 species (family Paradisaeidae) of small to medium-size forest birds that are rivaled by only a few pheasants and hummingbirds in colour and in the bizarre shape of the males’

plumage. Courting males perform mating rituals for hours on a perch or in a cleared space on the forest floor. Birds-of-paradise are found in the highlands of New Guinea and on nearby islands; some species are also found in Australia. Among the most notable species are the plumebirds, which are 12-18 in. (30^46 cm) long and have central tail feathers elongated as wires or twisted ribbons.

bird-of-paradise or crane flower Ornamental plant (Strelitzia reginae) of the family Strelitziaceae. All five species of the genus Strelitzia are native to southern Africa. The large, showy Strelitzia flower has two erect, pointed petals and five stamens. One main bract, shaped like a boat, is green with red borders. It holds many long-stemmed orange and bright blue flowers, each resembling the crest and beak of a crane, giving the plant its common names.

bird of prey Any member of the order Falconiformes (eagles, falcons, hawks, and vultures) or Strigiformes (owls). Falconiforms are also called raptors. They are active during the day, whereas owls are nocturnal. Condors and eagles are among the largest and strongest of flying birds. All birds of prey have a hook-tipped beak and sharp curved claws called talons. (Nonpredatory vultures have less-developed talons.) Despite the similarities between owls and raptors, many authorities believe they are not closely related but developed similar features because of their similar predatory lives.

bird stone Abstract stone carving by the prehistoric cultures of North America. They resemble birds and are about 6 in. (15 cm) long. Many were carved from black, brown, or dark green slate and polished with sand or other abrasive materials. All feature a pair of conical holes running diagonally through the base. They may have been used as weights or handles on a short rod (known as an atlatl) used to hurl spears or arrows.

bird-watching or birding Observation or identification of wild birds in their natural habitat. Basic equipment includes binoculars, a field guide to aid identification, and a notebook for recording time and place of sight-

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ings. The lists of bird observations compiled by members of local bird-watching societies are often useful to scientists in determining dispersal, habitat, and migration patterns of the various species. Bird-watching is primarily a 20th-century phenomenon; before 1900 most students of birds had to shoot them in order to identify them. Its popularity grew through the publication of journals and books, in particular the field guides (beginning in 1934) of Roger Tory Peterson.

bird's-foot trefoil Perennial, spreading, herbaceous legume {Lotus corniculatus) native to Europe and Asia but introduced to other regions. The stem grows to about 2 ft (60 cm) long. Its leaves consist of three oval leaflets, broadest near the tip. The yellow flowers (sometimes tinged with red) grow in clusters of 5 to 10. Often used as forage for cattle, it is occa-

sionally a troublesome weed.

Birdseye, Clarence (b. Dec. 9, 1886, New York, N.Y., U.S. — d. Oct. 7, 1956, New York) U.S. businessman and inventor. He developed a highly efficient process for freezing foods in small packages suitable for retailing. He achieved rapid freezing by placing packaged food, including fish, fruits, and vegetables, between two refrigerated metal plates. Though his were not the first frozen foods, his process largely preserved the original taste of the food. In 1929 his company was bought by Postum, Inc., which later became General Foods Corp. Birdseye served as a corporate executive until 1938.

birdsong Certain vocalizations of birds, characteristic of males during the breeding season, for the attraction of a mate and for territorial defense. Birdsong also reinforces pair bonds, and some species have a flight song. Birdsongs are usually more complex and longer than birdcalls, which are used for communication within a species. Birdsong may be hereditary or learned; a newly hatched male chaffinch, for example, can sing a “subsong” but must learn to sing the true song by listening to and imitating adult males.

birefringence See double refraction

Biringuccio Nbe-req-'gut-choV Vannoccio (b. Oct. 20, 1480, Siena — d. August 1537, Rome) Italian metallurgist and armaments maker. He is chiefly known for the first clear, comprehensive work on metallurgy, De la pirotechnia (published posthumously in 1540). His book, which contrasts strikingly with the obscure alchemical writings of the time, is replete with lavish woodcuts illustrating equipment and processes and includes clear, practical instructions for mining, smelting, and metalworking. It became a standard reference and remains a valuable resource on 15th- and 16th-century technology.

Birkenau See Auschwitz

Birkenhead, Frederick Edwin Smith, 1st earl of (b. July 12, 1872, Birkenhead, Cheshire, Eng. — d. Sept. 30, 1930, London) British politician. Elected to the House of Commons in 1906, he became noted as an orator and soon became a leader of the Conservative Party. As attorney general (1915-18), he successfully prosecuted Roger Casement. As lord chancellor (1919-22), he secured passage of the Law of Property Act (1922) and subsequent real-property statutes (1925) that replaced a convoluted system of land law. He also helped negotiate the Anglo-Irish Treaty of 1921.

Birmingham Vbor-miq-.hanA City (pop., 2000: 249,459), north-central Alabama, U.S. It is Alabama’s largest city. Founded in 1871 by a land company backed by railroad officials, it was named for the English city. It developed as the South’s iron and steel centre. From nearby Port Birmingham a barge canal leads south to Mobile. Birmingham was the scene of civil rights drives by Martin Luther King, Jr., in the early 1960s, and in 1963 four black girls were killed there in a church bombing; this incident gave major impetus to the civil rights movement.

Birmingham Vbor-miq-omV City and metropolitan borough (pop., 2001: 977,091), central England. Birmingham lies 100 mi (160 km) northwest of London. Its first charter was granted in 1166. It was a small manufacturing town until the 1 8th century, when it became a centre of the

Industrial Revolution, counting among its citizens James Watt, Joseph Priestley, and John Baskerville. It suffered heavy bombing during World War II but was subsequently rebuilt. It remains the chief centre of Britain's light and medium industry, and it is also the cultural centre for a wide area. Birmingham is the site of two universities and of a grammar school founded by King Edward VI in 1552.

Birney, (Alfred) Earle (b. May 13, 1904, Calgary, Alta., Northwest Territories [Canada] — d. Sept. 3, 1995, Toronto, Ont.) Canadian poet and educator. Birney received a Ph.D. from the University of Toronto and brought out his first collection of poetry, David (1942, Governor General's Award), during his time there. After serving in World War II, he published Now Is Time (1946, Governor General's Award) and other collections and held a number of teaching and editorial positions. His love of language led him to experiment with sound poems and to explore concrete poetry; he also wrote two novels, a drama in verse, and several radio plays.

Birney, James G(illespie) (b. Feb. 4, 1792, Danville, Ky., U.S. — d. Nov. 25, 1857, Eagleswood, N.J.) U.S. politician and antislavery leader. He practiced law in Danville, Ky., before moving to Alabama, where he was elected to the state legislature in 1819. He became active in the abolition movement and in 1837 was elected secretary of the American Anti-Slavery Society. After the group split, he helped lead the faction that became the Liberty Party; he was the party's presidential candidate in 1840 and 1844.

birth See parturition

birth control Voluntary limiting of human reproduction, using such means as contraception, sexual abstinence, surgical sterilization, and induced abortion. The term was coined in 1914-15 by Margaret Sanger. Medically, birth control is often advised when childbirth might endanger the mother's health or substantial risk exists of bearing a severely disabled child. Socially and economically, limitation of reproduction frequently reflects a desire to maintain or improve family living standards. Most religious leaders now generally agree that some form of fertility regulation is desirable, though the means are strongly debated. See also FAMILY PLANNING.

birth defect Genetic or trauma-induced abnormality present at birth. A more restrictive term than congenital disorder, it covers abnormalities that arise during the formation of an embryo's organs and tissues and does not include those caused by diseases (e.g., syphilis) that damage structures after they are formed.

birthmark Unusual mark or blemish on the skin at birth. Most birthmarks are either hemangiomas or moles. They are usually harmless and many fade in childhood; those that do not can sometimes be removed by laser surgery or abrasion.

birthstone Gemstone associated with the month of one's birth. Wearing one was popularly supposed to bring good luck or health. The ancient belief that supernatural powers could be attributed to gemstones is still held by some people today. The list of genuine stones (e.g., diamond, emerald, sapphire, ruby) was supplemented in the 20th century by a series of synthetic stones for use as less costly substitutes.

Birtwistle, Sir Harrison (Paul) (b. July 15, 1934, Accrington, Lancashire, Eng.) British composer. He began as a clarinetist, shifting to composition in his 20s. He cofounded the Pierrot Players with Peter Maxwell Davies (1967) but felt limited by the group's size. He concentrated on exploring large-scale time structures; his music's form is controlled by complex cyclical principles that he declined to discuss. His works include the theatre pieces Punch and Judy (1966-67), The Mask of Orpheus (1973-86), and Gawain (1991), and the orchestral works The Triumph of Time (1972), Silbury Air (1977), and Secret Theatre (1984).

BTrQnl \be-'ru-ne\, al- (b. September 973, Khwarezm, Khorasan — d. Dec. 13, 1048, Ghazna, Ghaznavid Afg.) Persian scientist and scholar. Sometime after 1017, he went to India, a land of which he wrote an encyclopaedic account. Later he settled at Ghazna in Afghanistan, where he enjoyed the support of the renowned MahmOd of Ghazna and other rulers of the Ghaznavid dynasty. Conversant with many languages, he wrote in Arabic, producing works on mathematics, astronomy, astrology, geography, physics, medicine, history, and chronology. His scientific achievements included accurate calculations of latitude and longitude and explanations of natural springs by the laws of hydrostatics. His best-known works are A History of India and Chronology of Ancient Nations.

Biscay, Bay of or Gulf of Gascony French Golfe de Gascogne

\,g6lf-d9-ga-'sk6n y \ Spanish Golfo de Vizcaya Vgol-fo-.tha-beth-'ka-ya\ Inlet of the Atlantic Ocean, bounded by southwestern France and northwestern Spain. It has an area of about 86,000 sq mi (223,000 sq km) and a maximum depth of 15,525 ft (4,735 m). It is known for its rough

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seas. Rivers flowing into the bay include the Loire, Adour, and Garonne. Its ports include (in France) Brest, Nantes, and Bordeaux, and (in Spain) Bilbao, Santander, and Aviles; none can accommodate large vessels. French coastal resorts include La Baule, Biarritz, and Saint-Jean-de-Luz.

Biscayne Bay Inlet of the Atlantic Ocean, southeastern U.S. Located along southeastern Florida, it is about 40 mi (64 km) long and 2-10 mi (3-16 km) wide; it forms part of the Atlantic Intracoastal Waterway. It is bordered by Miami on the northwest and the Florida Keys on the east. The bay was named for the early explorer El Biscaino, of Viscaya (Biscaya) province, Spain. See also Biscayne National Park.

Biscayne National Park Preserve, southeastern Florida, U.S. Located 20 mi (32 km) south of Miami, with an area of 172,925 acres (70,035 hectares), it consists mostly of coral reef and water containing some 33 keys that form a north-to-south chain separating Biscayne Bay from the Atlantic Ocean. It is noted for a wide variety of sea life. Authorized as Biscayne National Monument in 1968, it became a national park

in 1980.

Bischof Vbi-shoA, Werner (b. April 26, 1916, Zurich, Switz. — found dead May 16, 1954, Peruvian Andes) Swiss photojoumalist. He studied at the ZUrich Arts and Crafts School (1932-36). In 1942 he began working for the picture magazine Du, for which he photographed war-tom France, Germany, and The Netherlands. In 1949 he joined the cooperative photographers' agency Magnum Photos. He died in a car accident while working in Peru. Collections of his photographs were published in the books Japan (1954), Incas to Indians (1956), and The World of Werner Bischof { 1959).

Bishkek \bish-'kek\ or Pishpek \pish-'pek\ formerly (1926-91) Frunze \'frun-zi\ City (pop., 1999 est.: 619,000), capital of Kyrgyzstan. It lies on the Chu River near the Kyrgyz Mountains on the Kazakhstan border. In 1825 the Uzbek khanate of Kokand (see Qo'qon) established a fortress on the site, which in 1862 was captured by the Russians. The Russians mistakenly called it Pishpek. When the Kirgiz (Kyrgyz) Autonomous Soviet Socialist Republic was set up in 1926, the city became its capital and was renamed Frunze for a Red Army leader who was born there. It developed as an industrial city, especially in World War II (1939—45) when heavy industries from western Russia were moved there.

bishop In some Christian churches, the chief pastor and overseer of a diocese, an area containing several congregations. From the 4th century ad until the Reformation, bishops held broad secular and religious powers, including the settling of disputes, ordination of clergy, and confirmation of church members. Some Christian churches (notably the Anglican, Roman Catholic, and Eastern Orthodox churches) continue the bishop's office and the doctrine of Apostolic succession. Others, including some Lutheran and Methodist churches, retain bishops but not the principle of apostolic succession; still others have abolished the office altogether. Popes, cardinals, archbishops, patriarchs, and metropolitans are gradations of bishops. In Roman Catholicism, the pope selects the bishop; in Anglicanism, the dean and chapter of the cathedral of the diocese elect the bishop; in Methodism a synod chooses the bishop. See also episcopacy.

Bishop, Elizabeth (b. Feb. 8, 1911, Worcester, Mass., U.S. — d. Oct. 6, 1979, Boston, Mass.) U.S. poet. Bishop was reared by relatives in Nova Scotia, Can., after her father died and her mother was institutionalized. In the 1950s and '60s she lived principally in Brazil with the Brazilian woman she loved. Her first book of poems (1946) contrasts her New England origins and her love of hot climates; reprinted with additions as North & South: A Cold Spring (1955), it received the Pulitzer Prize. Her works are celebrated for their formal brilliance and their close observations of everyday reality. They have elicited much admiration from other poets. Posthumous publications include The Collected Prose (1984) and One Art (1994), a collection of her letters.

Bishop, J(ohn) Michael (b. Feb. 22, 1936, York, Pa., U.S.) U.S. virologist. He graduated from Harvard Medical School. In 1970 he and Harold Varmus tested the theory that healthy body cells contain oncogenes (cancer-causing genes). Further research showed that such genes can cause cancer even without viral involvement. By 1989, the year Bishop and Varmus shared a Nobel Prize for their research, scientists had identified more than 40 oncogenes in animals.

Bishop, William Avery known as Billy Bishop (b. Feb. 8, 1894,

Owen Sound, Ont., Can. — d. Sept. 11, 1956, West Palm Beach, Fla., U.S.) Canadian World War I fighter ace. Educated at the Royal Military College, he transferred from the cavalry to the Royal Flying Corps in 1915. While serving in France in 1917, he shot down 72 enemy aircraft, including 25 in one 10-day period. He was appointed to the staff of the British Air Ministry and helped form the Royal Canadian Air Force as a separate brigade. After the war he became a businessman and writer.

Bishop's University Privately endowed university in Lennoxville, Quebec, Canada, founded in 1843. It offers undergraduate and graduate programs in the humanities, social sciences, natural sciences, business, and education.

BIsitun N.be-si-'tunX ancient Behestun Town and historic site, western Iran. On a limestone cliff above the present village is a bas-relief and series of inscriptions purportedly commissioned by the Achaemenian king Darius the Great (r. 522-486 bc); inscriptions in Old Persian, Babylonian, and Elamite record how Darius killed a usurper, defeated rebel forces, and assumed the throne. The inscriptions were first copied (1837-47) by Sir Henry Rawlinson (1810-95), an officer of the East India Company The deciphering of the Old Persian was a major advance in the study of cuneiform WRITING.

bisj Vbis-e\ pole Carved wooden pole used in the religious rites of the South Pacific islands. The poles, 12-26 ft (4-8 m) tall, resemble an upended canoe with an exaggerated prow; they consist of carved figures placed one atop the other (thought to represent deceased ancestors) and terminate in a flat projection of ornate, openwork ornament. They are intended to harbour the souls of the dead, keeping them away from the village, and are also used to transmit magical powers. See also totem pole.

Bismarck \'biz-,mark\ City (pop., 2000: 55,532), capital of North Dakota, U.S. It was settled as a Missouri River port in the 1830s. In 1872 a military post was established to protect railway workers, and in 1873 it was named for Otto von Bismarck in the hope of attracting German investment. With the discovery of gold in the nearby Black Hills, it became a prospecting centre. In 1883 it was made the capital of Dakota Territory; when the territory was divided into two states in 1889, Bismarck became the capital of the northern state. Today it is the region’s business, cultural, and financial centre.

Bismarck German battleship of World War II. The formidable 52,600-ton (47,700-metric-ton) vessel was launched in 1939. British reconnaissance aircraft sighted it off Bergen, Norway, in May 1941, and almost the entire British home fleet was sent to intercept it. Two cruisers engaged it near Iceland, and the Bismarck destroyed the Hood before escaping to the open sea. Sighted 30 hours later, it was torpedoed and then bombarded by battleships throughout the night. The King George V and the Rodney crippled it in an hour-long attack, and it was finally sunk by torpedoes from the cruiser Dorsetshire.

Bismarck, Otto (Eduard Leopold), prince von (b. April 1, 1815, Schonhausen, Altmark, Prussia — d. July 30, 1898, Friedrichsruh, near Hamburg) Prussian statesman who founded the German Empire in 1871 and served as its chancellor for 19 years. Born into the Prussian landowning elite, Bismarck studied law and was elected to the Prussian Diet in

1849. In 1851 he was appointed Prussian representative to the federal Diet in Frankfurt. After serving as ambassador to Russia (1859-62) and France (1862), he became prime minister and foreign minister of Prussia (1 862—71). When he took office, Prussia was widely considered the weakest of the five European powers, but under his leadership Prussia won a war against Denmark in 1864 (see Schleswig-Holstein Question), the Seven Weeks' War (1866), and the Franco- Prussian War (1870-71). Through these wars he achieved his goal of political unification of a Prussian-dominated German Empire. Once the empire was established, he became its chancellor. The “Iron Chancellor” skillfully preserved the peace in Europe through alliances against France (see Three Emperors' League; Reinsurance Treaty; Triple Alliance). Domestically, he introduced administrative and economic reforms but sought to preserve the status quo, opposing the Social Democratic Party and the Catholic church (see Kulturkampf). When Bismarck left office in 1 890, the map of Europe had been changed immeasurably. However, the German Empire, his greatest achievement, survived him by only 20 years because he had failed to create an internally unified people.

Bismarck Archipelago Island group, western Pacific Ocean. Lying northwest of New Guinea, it forms part of Papua New Guinea. It has a total area of 19,173 sq mi (49,658 sq km); its largest components include New Britain, New Ireland, the Admiralty Islands, and New Hanover (Lavongai).

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Annexed by Germany in 1884, it was named for Otto von Bismarck. Occupied by Australia in 1914, it was made a mandated territory of Australia in 1920. The group became part of the UN Trust Territory of New Guinea after World War II and part of Papua New Guinea when it attained independence in 1975.

bismuth \ 'biz-math \ Semimetallic to metallic chemical element, chemical symbol Bi, atomic number 83. Hard, brittle, and lustrous, it has a distinctive gray-white colour with a reddish tinge. It is often found free in nature and also occurs in compounds and in mixed ores. Bismuth alloys are used (because of their low melting points) in making metal castings, special solders, automatic sprinkler heads, fuses, and many fire-detection devices. Bismuth phosphomolybdate is a catalyst in the production of acrylonitrile, an important raw material for fibres and plastics. Salts of bismuth are used in making soothing agents for digestive disorders (especially bismuth subsalicylate), in treating skin infections and injuries, and in lipstick, nail polish, and eye shadow, to which they impart a pearlescent quality.

bison Vbl-s 3 n, 'bl-z 3 n\ Either species (genus Bison) of oxlike bovid with a convex forehead and a pronounced shoulder hump. Its dark brown, coarse hair is especially long on the head, which is held low, and on the neck and shoulders. Both sexes bear

heavy, curved horns. A mature bull stands about 6.5 ft (2 m) at the shoulder and weighs more than 1,980 lb (900 kg). Bison live in herds. The American bison (B . bison), commonly called buffalo, was abundant over most of North America when Europeans arrived. Uncontrolled hunting drove it nearly to extinction by 1900, but it has since recovered. The European bison (B . bonasus) is similar and survives only in a few managed herds.

Bissau \bis-'au\ Seaport (pop., 1999 est.: 274,000), capital of Guinea-Bissau. Lying on an estuary of the Geba River where it flows into the Atlantic Ocean, the port originated in 1687 as a Portuguese fortified post. In 1941 it replaced Bolama as the country’s capital and has since developed as an excellent roadstead for large vessels.

bit in full binary digit In communication and information theory, a unit of information equivalent to the result of a choice between only two possible alternatives, such as 1 and 0 in the binary code generally used in digital computers. It is also applied to a unit of memory corresponding to the ability to store the result of a choice between two alternatives. A byte consists of a string of eight consecutive bits and makes up the basic information processing unit of a computer. Because a byte includes only an amount of information equivalent to one letter or one symbol (e.g., a comma), the processing and storage capacities of computer hardware are usually given in kilobytes (1,024 bytes), megabytes (1,048,576 bytes), and even gigabytes (about 1 billion bytes) and terabytes (1 trillion bytes).

bit-map Method by which a display space (such as a graphics image file) is defined, including the colour of each of its pixels (or bits). In effect, a bit-map is an array of binary data representing the values of pixels in an image or display. A GIF is an example of a graphics image file that has a bit-map. When the GIF is displayed on a computer monitor, the computer reads the bit-map to determine which colours to use to “paint” the screen. In a bit-mapped font, each character is defined as a pattern of dots in a bit-map.

Bithynia \ba-'thin-e-a\ Ancient country, northwestern Anatolia. Bounded by the Sea of Marmara, the Bosporus, and the Black Sea, it was settled by Thracians in the late 2nd millennium bc. They never submitted to Alexander the Great, and by the 3rd century bc a powerful Hellenistic kingship had been established in the area. There followed a century of inept leadership and rapid decline. Bithynia’ s last king, Nicomedes IV, bequeathed his kingdom to the Romans in 74 bc.

bittern Any of 12 species of solitary marsh birds (family Ardeidae), related to herons but having a shorter neck and a stouter body. Most bitterns bear a camouflage pattern (streaks of variegated brown and buff) that enables them to hide by standing upright with bill pointed upward, imitating the reeds and grasses of their habitat. They feed on fish, frogs,

(genus Bison) of oxlike bovid with

American bison, or plains buffalo
(Bison bison).

ALAN G. NELSON/ROOT RESOURCES

crayfish, and other small swamp and marsh animals, which they spear with their sharp-pointed bills. Bitterns are found almost worldwide. The largest species grow to 30 in. (75 cm), the smallest to about 12-16 in. (30^10 cm).

Bitterroot Range Segment of the northern Rocky Mountains, U.S. Extending north-south 300 mi (480 km) along the Idaho-Montana border, its peaks average about 9,000 ft (2,700 m); Idaho's Scott Peak is the highest, at 11,393 ft (3,473 m). Owing to the mountains' inaccessibility from the east, the Lewis and Clark Expedition (1805) had to travel north more than 100 mi (160 km) to find a route through the range. Bitterroot National Forest extends across the centre of the range.

bittersweet Any of several vines with colourful fruit. The genus Celastrus (family Celastraceae) includes American bittersweet, or staff vine (C. scandens), and Oriental bittersweet (C. orbiculatus), woody vines grown as ornamentals. Oriental bittersweet is a more vigorous climber than the American species. Both types climb by twining around supports. Another bittersweet, Solanum dulcamara, belongs to the nightshade family.

bitumen \ba-'tyu-man\ Mixture of tarlike hydrocarbons derived from petroleum. Black or brown, it varies from viscous to solid; the solid form is usually called asphalt. Bitumen occurs in nearly every part of the world and in nearly the whole range of geologic strata. The term may also refer to synthetic hydrocarbon compounds.

bituminous Vba-'tyii-ma-nasN coal or soft coal Most abundant form of coal. It is dark brown to black and has a relatively high heat value. Widely abundant and with the broadest range of commercial uses, it has long been used for steam generation in electric power plants and industrial boiler plants. Certain varieties are also used to make coke, a hard substance of almost pure carbon that is important for smelting iron ore. One major problem is that burning large quantities of bituminous coal that has a medium to high sulfur content contributes to air pollution and produces acid rain. See also subbituminous coal.

bituminous sand See tar sand

bivalve Any member of the mollusk class Bivalvia, or Pelecypoda, characterized by having a two-halved (valved) shell. Clams, cockles, mussels, oysters, scallops, and shipworms are bivalves. Most are completely enclosed by the shell, the two valves of which are joined by an elastic ligament,

posterior

adductor

muscle

anterior adductor digestive gland
muscle

foot

ganglion

intestine

mantle gills

excurrent

siphon

incurrent

siphon

Internal structure of a clam. A ligament hinges the shell's two halves (valves) open, and the beating motion of cilia on the gills causes water to enter through the incurrent siphon. As water moves over the gills, oxygen diffuses into the blood, and food particles become trapped in mucus and are moved to the mouth. A pair of adductor muscles can hold the shell tightly closed. A fold of tissue (mantle) encloses the body's organs and releases the material that forms the shell. A large muscular foot allows the clam to creep and burrow. The circulatory system consists of a heart and blood vessels, and kidneys remove wastes from the blood. Deoxygenated blood and wastes are removed in the water that exits through the excurrent siphon.

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and by two sheets of tissue called the mantle. Bivalves have no head. They feed on phytoplankton by pumping water across the gills and trapping food particles that are then moved to the mouth. Bivalves are found in most parts of the ocean from the intertidal zone to abyssal depths.

Biwa \'be-wa\, Lake Lake, west-central Honshu, Japan. It is Japan’s largest lake, measuring 40 mi (64 km) long and up to 12 mi (19 km) wide, with an area of 259 sq mi (670 sq km). Its name refers to the musical instrument (see pipa) that the lake resembles in shape. Its sole outlet, the Yodo River, flows from its southern tip to Osaka Bay. Lake Biwa is noted for its pearl culture industry. Its great scenic beauty, long a subject of Japanese poetry, makes it one of Japan’s major tourist attractions.

Bizet \be-'za\, Georges orig. Alexandre-Cesar-Leopold Bizet

(b. Oct. 25, 1838, Paris, France — d. June 3, 1875, Bougival) French composer. Son of a music teacher, he gained admission to the Paris Conservatoire at age 9, and at age 17 he wrote the precocious Symphony in C Major (1855). Intent on success on the operatic stage, he produced The Pearl Fishers (1863), La Jolie Fille de Perth { 1866), and Djamileh (1871). Disgusted with the frivolity of French light opera, he determined to reform the genre of opera comique. In 1875 his masterpiece, Carmen , reached the stage. Though its harsh realism repelled many, Carmen quickly won international enthusiasm and was recognized as the supreme example of opera comique. Bizet's death soon after its premiere cut short a remarkable career.

Bjorling Vbyoer-liqX, Jussi orig. Johan Jonaton Bjorling (b. Feb. 2, 1911, Stora Tuna, Swed. — d. Sept. 9, 1960, Siaro) Swedish tenor. He began to sing in public as a child and toured Europe and the U.S. with his family. Recruited by the Royal Swedish Opera in 1928, he was soon a star performer. He made his Metropolitan Opera debut in 1938 as Rodolfo in La Boheme. He remained in Sweden during World War II but returned to the Met for several seasons afterward. He became a favourite on stage and in recordings for the sheer beauty and musicality of his singing.

Bjornson Vbycern-sonX, Bjornstjerne (Martinius) (b. Dec. 8, 1832, Kvikne, Nor.— d. April 26, 1910, Paris, France) Norwegian writer, editor, and theatre director. He worked to stimulate national pride by linking Norwegian history and legend to modern ideals. Together with Henrik Ibsen, Alexander Kielland, and Jonas Lie, he is known as one of "the four great ones" of 19th-century Norwegian literature. He won the Nobel Prize for Literature in 1903. His poem "Yes, We Love This Land Forever" is the Norwegian national anthem.

Black, Hugo (La Fayette) (b. Feb. 27, 1886, Clay county, Ala., U.S. — d. Sept. 25, 1971, Bethesda, Md.) U.S. Supreme Court justice (1937-71). After practicing law in Alabama from 1906, he served in the U.S. Senate (1927-37), where he was a strong supporter of the New Deal. Pres. Franklin Roosevelt appointed him to the Supreme Court of the United States, where he helped reverse earlier court decisions against New Deal legislation. In the 1960s he was prominent in the liberal majority that struck down mandatory school prayer and guaranteed the availability of legal counsel to suspected criminals. He became best known for his absolutist belief in the Bill of Rights as a guarantee of civil liberties. His last major opinion supported the right of the New York Times to publish the Pentagon Papers (1971).

Black, Sir James (Whyte) (b. June 14, 1924, Uddingston, Scot.) Scottish pharmacologist. Through studying interactions between receptors on cells and chemicals in the bloodstream that attach to them, Black developed the first of the beta-blocking drugs, to relieve angina pectoris. He used a similar approach to develop drugs for stomach and duodenal ulcers. He shared a 1988 Nobel Prize for Physiology or Medicine with George H. Hitchings and Gertrude Elion.

Black Aesthetic movement or Black Arts movement Period of artistic and literary development among black Americans in the 1960s and early '70s. Based on the cultural politics of black nationalism, the movement sought to create art forms capable of expressing the varieties

of black experience in the U.S. Leading theorists included Amiri Baraka, Houston Baker (b. 1943), and Henry Louis Gates. Don L. Lee (b. 1942), known as Haki R. Madhubuti after 1973, was one of its most popular writers; other notable writers included Toni Morrison, Alice Walker, and Ntozake Shange (b. 1948). The movement also produced such autobiographical works as The Autobiography of Malcolm X (1965; with Alex Haley), Eldridge Cleaver's Soul on Ice (1968), and Angela Davis: An Autobiography (1974).

Black and Tan Member of a British auxiliary force employed in Ireland against the republicans (1920-21). When Irish nationalist agitation intensified after World War I, many Irish police resigned and were replaced by these temporary English recruits, who dressed in a mixed "black and tan" outfit because of a shortage of uniforms. In their efforts to thwart the terrorism of the Irish Republican Army, the Black and Tans themselves engaged in brutal reprisals.

black bass Any of about six species (genus Micropterus) of slender freshwater fishes of the sunfish family; found in eastern North America. Two, the largemouth and smallmouth black basses, have been introduced into other countries and are prized as hard-fighting game fishes. Black basses are larger and longer-bodied than sunfishes and more predatory. The largemouth bass may grow to 32 in. (80 cm) long and weigh 22 lbs (10 kg); it lives in quiet weedy lakes and streams. The smallmouth bass, which usually grows to 5-6 lbs (2-3 kg), inhabits clear, cool lakes and running streams.

black bear Forest-dwelling bear (Ursus americanus) that, despite reductions in population and range, is still the most common North American bear. The adult ranges from 5 to 6 ft (150-180 cm) in length and weighs 200-600 lbs (90-270 kg). It has various colour morphs but always a brown face and usually a white chest mark. It eats animals and vegetation, including pinecones, berries, and roots. It frequently raids campsites and seizes anything edible. Though it may be tamed and taught tricks, it often becomes dangerous when mature.

Black Canyon of the Gunnison National Park Park, western Colorado, U.S. Comprising a narrow, deep gorge of the Gunnison River, the preserve, established as a national monument in 1933 and elevated to a national park in 1999, occupies an area of 51 sq mi (133 sq km). The canyon derives its name from its black-stained, lichen-covered walls, which accentuate the gloom of the chasm.

black codes Laws, enacted in the former Confederate states after the American Civil War, that restricted the freedom of former slaves and were designed to assure white supremacy. They originated in the slave codes, which defined slaves as property. In some states these codes included vagrancy laws that targeted unemployed blacks, apprentice laws that made

black orphans and dependents available for hire to whites, and commercial laws that excluded blacks from certain trades and businesses and restricted their ownership of property. Northern reaction to the laws helped produce Radical Reconstruction and passage of the 14th and 15th amendments to the Constitution, as well as creation of the Freedmen's Bureau. Many provisions of the black codes were reenacted in the Jim Crow laws and remained in force until the 1964 Civil Rights Act.

Black Death Fierce and widespread outbreak of plague, probably bubonic and pneumonic, that ravaged Europe during the 14th century. The epidemic originated in Asia and was transmitted to Europeans in 1347 when a Turkic army besieging a Genoese trading post in the Crimea catapulted plague-infested corpses into the town. It spread from the Mediterranean ports and ravaged all of Europe between 1347 and 1351. Renewed outbreaks occurred in 1361-63, 1369-71, 1374-75, 1390, and 1400. Towns and cities were more heavily hit than the countryside, and whole communities were sometimes destroyed. Much of Europe’s economy was devastated. About one-third of the European population, or a total of 25 million people, died in the Black Death.

black-eyed pea See cowpea

black-eyed Susan Either of two North American coneflowers (Rudbeckia hirta and R. serotina) having flower heads with deep yellow to orange petals and dark conical centers. The stems are rough and hairy; the leaves are large and ovate at the base of the plant and narrow at the top.

black-figure pottery Type of Greek pottery that originated in Corinth c. 700 bc. The figures were painted in black pigment on the natural red clay ground. Finishing details were then incised into the black pigment,

(Ursus americanus) that, despite

American black bear (Ursus americanus)

LEONARD LEE RUE III

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revealing the red ground. The great Attic painters (mid 6th century bc), most notably Exekias, developed narrative scene decoration and perfected the style. It continued to be popular until the advent of red-figure pottery (c. 530 bc).

Black Forest German Schwarz-
wald Vshfarts-.vahA Mountain
region, Baden- Wlirttemberg, south-
western Germany. It extends in a
fairly narrow strip about 100 mi (160
km) along the eastern bank of the
upper Rhine River, from the Neckar
River to the Swiss border. Its highest
peak is Feldberg, at 4,897 ft (1,493
m). Its name comes from its dark
interior, the higher parts being
thickly forested with fir and pine. It
is the source of the Neckar and
Danube rivers. The setting of many of
the Grimm brothers' fairy tales, it is
famed for the beauty and charm of
its villages and rolling hills. Winter
sports are prominent in the area, which also has many mineral springs
and watering places, including the spa town of Baden-Baden.

Black Friday Day (Sept. 24, 1869) when plunging gold prices precipi-
tated a U.S. stock-market panic. An attempt by Jay Gould and James Fisk
to corner the market in gold and drive up its price depended on prevent-
ing the sale of government gold, an arrangement assured through the two
men's political influence. When Pres. Ulysses S. Grant heard of the
scheme, he ordered the government to sell $4 million in gold, which
caused the price to drop and produced a panic selling of other stocks.

black gum or sour gum Most widely distributed tupelo, Nyssa syl-
vatica, also known as black tupelo or pepperidge tree. It is found in moist
areas of the eastern U.S. from Maine south to the Gulf Coast and west-
ward to Oklahoma. Its wood is light and soft but tough. The black gum
is sometimes grown as an ornamental and is prized for its brilliant scar-
let autumnal foliage.

Black Hand Secret Serbian society formed in 1911 primarily by army
officers, which used terrorist methods to promote the liberation of Serbs
outside Serbia from Habsburg or Ottoman rule. It conducted propaganda
campaigns, organized armed bands in Macedonia, and established revo-
lutionary cells throughout Bosnia. Within Serbia it dominated the army
and wielded tremendous influence over the government. It gained its
greatest notoriety with the assassination of Archduke Francis Ferdinand in
1914. After a trial in 1917, three leaders were executed and more than
200 were imprisoned. The name also referred to several extortion rackets
run by immigrant Sicilian and Italian
gangsters in the Italian communities
of many large U.S. cities c. 1890-
1920. Local merchants and wealthy
individuals would receive threaten-
ing notes printed with black hands,
daggers, or other menacing symbols
that demanded money on pain of
death or destruction of property. It
declined with the beginning of Pro-
hibition and large-scale bootlegging.

Black Hawk (b. 1767, Sauk Sau-

tenuk, Va. — d. Oct. 3, 1838, village on the Des Moines River, Iowa,

U.S.) Sauk Indian leader. Long antagonistic to whites, Black Hawk was driven into Iowa from Illinois in 1831. Defying the government orders to vacate villages along the Rock River in Illinois, he led a faction of Sauk and Fox Indians back across the Mississippi River the following year. This act led to the brief

but tragic Black Hawk War of 1832. He himself survived the final battle, a massacre. The ruthlessness of the war so affected neighbouring Indian groups that by 1837 most had fled far west, leaving most of the Northwest Territory to white settlers.

Black Hills Group of mountains in western South Dakota and northeastern Wyoming, U.S. Occupying about 6,000 sq mi (15,540 sq km), they lie between the Cheyenne and Belle Fourche rivers and rise to a maximum elevation of 7,242 ft (2,207 m) at Harney Peak. Their name refers to the dark appearance that their rounded hilltops and well-forested slopes present at a distance. The Sioux Indians were guaranteed treaty rights to the region in 1868; however, the discovery of gold in 1874 led to an influx of white miners and to the Black Hills War (1876), including the Battle of the Little Bighorn. Tourist attractions include the mining town of Deadwood, Mount Rushmore and Jewel Cave national monuments, Wind Cave National Park, and Custer State Park, all in South Dakota, and Devils Tower National Monument in Wyoming.

black hole Cosmic body with gravity (see gravitation) so intense that nothing, not even light, can escape. It is suspected to form in the death and collapse of a star that has retained at least three times the Sun’s mass. Stars with less mass evolve into white dwarf stars or neutron stars. Details of a black hole’s structure are calculated from Albert Einstein’s general theory of relativity: a “singularity” of zero volume and infinite density pulls in all matter and energy that comes within an event horizon, defined by the Schwarzschild radius, around it. Black holes cannot be observed directly because they are small and emit no light. However, their enormous gravitational fields affect nearby matter, which is drawn in and emits X rays as it collides at high speed outside the event horizon. Some black holes may have nonstellar origins. Astronomers speculate that supermassive black holes at the centres of quasars and many galaxies are the source of energetic activity that is observed. Stephen W. Hawking theorized the creation of numerous tiny black holes, possibly no more massive than an asteroid, during the big bang. These primordial “mini black holes” lose mass over time and disappear as a result of Hawking radiation. Although black holes remain theoretical, the case for their existence is supported by many observations of phenomena that match their predicted effects.

black humour Humour marked by the use of morbid, ironic, or grotesquely comic episodes that ridicule human folly. The term came into common use in the 1960s to describe the work of novelists such as Joseph Heller, whose Catch-22 (1961) is an outstanding example; Kurt Vonnegut, particularly in Slaughterhouse Five (1969); and Thomas Pynchon, in V (1963) and Gravity’s Rainbow (1973). A film exemplar is Stanley Kubrick’s

Dr. Strangelove (1963). The term black comedy has been applied to some playwrights in the Theatre of the Absurd, especially Eugene Ionesco.

black lead See graphite

Black Legend Stories from the Spanish colonies in the Americas that led to the general belief, eagerly endorsed by such rivals as Britain and Holland, that Spain exceeded other nations in cruelty to its subject populations. The 16th-century historians Bartolome de Las Casas and Garcilaso de la Vega documented the treatment of the Indians in New Spain (Mexico and Guatemala) and Peru, respectively, and laid the foundation for the legend. Though Spain may not actually have surpassed other colonial powers in cruelty, the Spanish conquest clearly reduced the numbers of indigenous peoples rapidly and caused them great suffering.

black letter or Gothic script or Old English script Style of alphabet used in handwriting throughout Europe in the Middle Ages. It features uniform vertical strokes that end on the baseline, angular lines instead of smooth curves and circles, and the overlapping of convex forms. Black letter and roman were the dominant letter shapes of medieval typography. The only extant work known to have been printed by Johannes Gutenberg, the 42-line Bible (1450s), was set in black-letter type. Roman type largely superseded it in the Renaissance, though black letter persisted in Germany well into the 20th century. Today black letter is often used for diplomas, Christmas cards, and liturgical writings.

black market Trading in violation of publicly imposed regulations such as rationing laws, laws against the sale of certain goods, and official rates of exchange among currencies. Black-market activity is common in wartime, when scarce goods and services are often strictly rationed (see rationing). Black-market foreign-exchange transactions flourish in countries where convertible foreign currency is scarce and foreign exchange is tightly controlled.

Dionysus and satyrs, amphora painted in the black-figure style by the Amasis Painter, c. 540 bc; in the Antikenmuseum, Basel, Switz.

COURTESY OF THE ANTIKENMUSEUM, BASEL, SWITZ.; PHOTOGRAPH, COLORPHOTO HANS HINZ

Black Hawk, oil painting by George Catlin, 1 832; in the National Museum of American Art, Smithsonian Institution, Washington, D.C.

COURTESY OF NATIONAL MUSEUM OF AMERICAN ART, SMITHSONIAN INSTITUTION, WASHINGTON, D.C.

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Black Muslims See Nation of Islam

black nationalism U.S. political and social movement aimed at developing economic power and community and ethnic pride among African Americans. It was proclaimed by Marcus Garvey in the early 20th century, when many U.S. black nationalists hoped for the eventual creation of a separate black nation in Africa. In the 1960s and ’70s, Elijah Muhammad and Malcolm X preached the ideal of black nationalism as an alternative to assimilation into the predominantly white culture of the U.S.

Black Panther Party (for Self-Defense) U.S. African American revolutionary party founded in 1966 by Huey Newton and Bobby Seale (b. 1936) in Oakland, Calif. Its original purpose was to protect African Americans from acts of police brutality. Eventually the Panthers developed into a Marxist revolutionary group that called for the arming of African Americans, their exemption from the draft, the release of all African American prisoners, and payment of compensation to African Americans for centuries of exploitation by white Americans. By the late 1960s it had more than 2,000 members, with chapters in several major cities; an early spokesman was Eldridge Cleaver (1935-98). Conflicts with police in the late 1960s and early ’70s led to shoot-outs in California, New York, and Chicago, one of which resulted in Newton’s imprisonment for the murder of a police officer. Though some members of the party were guilty of criminal acts, the entire group was subjected to violent attacks by police and harassment by other government agencies, including the Federal Bureau of Investigation. Police activities in dealing with the Panthers were later the subject of congressional investigations. By the mid-1970s, having lost many members and having fallen out of favour with African American leaders, the party turned to providing social services in African American neighbourhoods. By the early 1980s it had effectively disbanded.

black pepper or pepper Perennial, woody climbing vine {Piper nigrum) of the family Piperaceae, native to India; also, the hotly pungent spice made from its berries. One of the earliest spices known, pepper is probably the most widely used spice in the world today. It early became an important article of overland trade between India and Europe. The plant is cultivated throughout Indonesia and has been introduced into tropical areas elsewhere. It has broad, shiny leaves and dense, slender spikes of small flowers. The small berrylike fruits are called peppercorns. See also PEPPER.

black sand Accumulation of fragments of durable, usually dark, heavy minerals (those with a density greater than that of quartz). These accumulations are found in streambeds or on beaches where stream flow and wave energy are sufficient to carry away low-density material but not the heavy minerals. Thus, heavy minerals resistant to weathering and abrasion concentrate in these areas, though they may be only minor constituents of inland rocks. Placer mining of such deposits yields magnetite, cassiterite, and zircon, as well as gold, platinum, and other rare metals.

Black Sea Sea between Europe and Asia. Bordered by Ukraine, Rus-

sia, Georgia, Turkey, Bulgaria, and Romania, it has a maximum depth of 7,250 ft (2,210 m). The Black Sea proper has an area of 163,000 sq mi (422,000 sq km). It is connected with the Aegean Sea through the Bosporus, the Sea of Marmara, and the Dardanelles, and with the Sea of Azov by Kerch Strait. It receives many rivers, including the Danube, Dniester, Bug, Dnieper, Kuban, Kizil, and Sakarya. The Crimean Peninsula (see Crimea) extends into it from the north. Created when structural upheavals in Asia Minor split off the Caspian basin from the Mediterranean Sea, the Black Sea gradually became isolated; salinity is now less than half that of the world's oceans. Though long popular for its resorts, it has suffered severe pollution in recent decades.

black snake Any of several species of all-black or nearly all-black snakes. Australian black snakes are in the elapid genus Pseudeschis. The black snake of Australian wetlands (P. porphyriacus) grows to an average length of 5 ft (1.5 m). If annoyed, it expands its neck, cobra fashion. Its venom is rarely fatal. Other Australian black snakes are the mulga snake (P. australis) and the spotted black snake (P. guttatus). North American black snakes include two species in the family Colubridae: the black racer and the pilot black snake (Elaphe obsoleta).

Black Sox scandal U.S. baseball scandal, centring on the charge that eight members of the Chicago White Sox had been bribed to lose the 1919 World Series to the Cincinnati Reds. Five of those accused admitted to a grand jury that they had thrown the series, but their signed confessions later disappeared. Although all eight players were acquitted in 1921, commissioner Kenesaw Mountain Landis banned them from playing for life.

Black Stone of Mecca Muslim object of veneration, built into the eastern wall of the Kaaba and probably predating Islam. It consists of three large pieces of stone and some fragments, surrounded by a stone ring and held together with a silver band. According to legend, the stone was given to Adam on his fall from paradise and was originally white but has been made black by the sins of the thousands of pilgrims who have touched and kissed it.

black theatre In the U.S., a dramatic movement encompassing plays written by, for, and about blacks. The first known play by an American black was James Brown's King Shotaway (1823). After the Civil War, blacks began to perform in minstrel shows, and musicals written, produced, and acted entirely by blacks appeared by c. 1900. The first real success of a black dramatist was Angelina W. Grimke's Rachel (1916). Theatre flourished during the Harlem Renaissance of the 1920s and '30s, and by 1940 the American Negro Theater and the Negro Playwrights' Co. were firmly established. After World War II black theatre grew more progressive and militant, seeking to establish its own mythology, abolish racial stereotypes, and integrate black playwrights into the mainstream. Its strongest proponent, Amiri Baraka, established the Black Arts Repertory Theatre in 1965. In the 1980s and '90s the African American playwrights Charles Fuller and August Wilson won Pulitzer Prizes.

Black Warrior River Navigable river, western Alabama, U.S. Formed by the confluence of the Locust and Mulberry forks in Jefferson county, it flows southwest through coalfields to join the Tombigbee River near Demopolis. The river is 178 mi (286 km) long and furnishes waterpower above Tuscaloosa.

black widow Any of several black spiders in the genus Latrodectus with a venomous bite that is rarely fatal to humans. Black widow species are found worldwide, with three living in North America. In Australia it is called the redback. The females are shiny black, usually with a reddish hourglass-shaped design on the underside of the spherical abdomen and with a body about 1 in. (2.5 cm) long. The black widow preys on insects. The male, about one-fourth the female's size, is often killed and eaten by the female after mating (the source of its name).

Blackbeard orig. Edward Teach (b. Bristol?, Eng. — d. Nov. 22, 1718, Ocracoke Island, North Carolina) English pirate. He was probably a privateer in the West Indies until 1716. With his 40-gun warship, he preyed on shipping off the Virginia and Carolina coasts, sharing his prizes with the governor of the North Carolina colony in return for protection. He was eventually killed by a British naval force, and his head, with its great black beard, was affixed to the end of his bowsprit. According to legend, he left a great buried treasure; it has never been found and probably never existed.

blackberry Usually prickly, fruit-bearing bush of the genus Rubus, in the rose family, native chiefly to northern temperate regions. The blackberry is abundant in eastern North America and on the Pacific coast; in Europe it is common in thickets and hedges. Its usually biennial, prickly, and erect, semierect, or trailing stems bear leaves with usually three or five oval, coarsely toothed, stalked leaflets; white, pink, or red flowers in terminal clusters; and black or red-purple aggregate fruits. The several trailing species are commonly called dewberries.

Blackberries are a fairly good source of iron and vitamin C.

blackbird In the New World, any of several species of songbirds in the family Icteridae, collectively called icterids; also, an Old World thrush {Turdus merula, family Turdidae). The best known icterid is the red-winged blackbird (Agelaius phoeniceus), which ranges from Canada to the West Indies and Central America. It is 8 in. (20 cm) long, and the male's black plumage is set off by red shoulder patches. The Old World blackbird, 10 in. (25 cm) long, is common in woods and gardens throughout temperate Eurasia as well as in Australia and New Zealand. See also grackle.

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blackbody Theoretical surface that absorbs all radiant energy that falls on it, and radiates electromagnetic energy at all frequencies, from radio waves to gamma RAYS, with an intensity distribution dependent on its temperature. Because all visible light falling on such a surface is absorbed without reflection, the surface will appear black as long as its temperature is such that its emission peak is not in the visible portion of the spectrum. See also absorption.

blackcap Common warbler (Sylvia atricapilla, family Sylviidae) from Europe and North Africa to central Asia. It is about 6 in. (14 cm) long and has brownish upper parts, gray underparts and face, and a black (male) or reddish brown (female) crown. Common in woodland borders and rough hedges, it has a rich song.

Blackett \'blak-ot\ (of Chelsea),

Patrick M(aynard) S(tuart),

Baron (b. Nov. 18, 1897, London,

Eng. — d. July 13, 1974, London)

British physicist. He graduated from the University of Cambridge in 1921 and spent 10 years at the Cavendish Laboratory, where he developed the Wilson cloud chamber into an instrument for the study of cosmic radiation. He was awarded a 1948 Nobel Prize for his discoveries and was made a life peer in 1969.

blackfly Any member of the insect family Simuliidae, comprising 300 species of small, humpbacked dipterans found worldwide. Usually black or dark gray, the blackfly has short mouthparts adapted for sucking blood. The females bite and are sometimes abundant enough to kill chickens and even cattle. Some species carry worms capable of causing human disease, including river blindness. In subarctic regions blackflies may be so numerous that human habitation is impossible.

Blackfoot or Blackfeet Group of ALGONQUiAN-speaking Indian peoples in Alberta, Can., and Montana, U.S., comprising the Piegan (Pikuni or Blackfeet), the North Piegan Pikuni, the Blood (Kainai), and the Blackfoot proper (Siksika). Together they are referred to as Siksika, or Blackfoot, a name thought to have derived from the discoloration of moccasins with ashes. They were among the first Algonquians to move westward from timberland to open grassland and, later, among the first to acquire horses and firearms. They were

known as the strongest and most aggressive military power on the northwestern plains. At the height of their power, in the first half of the 19th century, they held a vast territory extending from northern Saskatchewan to southwestern Montana. Each group was subdivided into hunting bands led by one or more chiefs. These bands wintered separately but came together in summer to celebrate the sun dance. For three decades beginning in 1806, the Blackfoot prevented white men from settling in their territory. They signed their first treaty with the U.S. in 1855, after which they were forced into farming and cattle raising. Some 10,000 Blackfoot live in Canada, and more than 27,000 claimed sole Blackfoot descent in the 2000 U.S. census, although only 15,000 U.S. Blackfoot are enrolled members. See photograph opposite.

blackjack or twenty-one Card game whose object is to be dealt cards having a higher count than those of the dealer, up to but not exceeding 21. The dealer may use a single deck of 52 cards or two or more decks from a holder called a shoe. Aces count as 1 or 1 1 , and face cards as 10. Depending on the rules used, bets may be placed before the deal, after each player has been dealt one card facedown, or after each player has received two cards facedown and the dealer has exposed one of his cards.

blackmail See extortion

Blackmun, Harry (b. Nov. 12, 1908, Nashville, 111., U.S. — d. March 4, 1999, Arlington, Va.) U.S. jurist. He received his law degree from Harvard (1932) and taught law at the St. Paul College of Law (1935-41) while advancing to general partner in a Minnesota law firm. After serving as resident counsel to the Mayo Clinic (1950-59), he was appointed to the Eighth U.S. Circuit Court of Appeals. In 1970 Pres. Richard Nixon named him to the Supreme Court of the United States, where he served until 1994. Perceived as a conservative when he began his Supreme Court service, Blackmun became increasingly liberal over the years. He wrote the majority decision in Roe v. Wade (1973).

blackpoll warbler Species (Dendroica striata) of wood warbler. Like all wood warblers, it is a small, active bird that feeds on insects and has a short thin bill. A common species, it is less striking than many other wood warblers, which are known for their brightly coloured plumage.

Blackshirts Italian Camicie Nere Armed squads of Italian Fascists under Benito Mussolini who wore black shirts as part of their uniform. The squads, first organized in 1919, targeted socialists, communists, republicans, and others. Hundreds of people were killed as the squads grew in number. In 1922 Blackshirts from all over Italy participated in the March on Rome (see Rome, March on). In 1923 the private Blackshirts were officially transformed into a national militia. With Mussolini’s fall in 1943, the Blackshirts fell into disgrace.

Blackstone, Sir William (b. July 10, 1723, London, Eng. — d. Feb. 14, 1780, Wallingford, Oxfordshire) British jurist. Orphaned at age 12, he was educated at public school and later at Pembroke College, Oxford, at the expense of his uncle, a London surgeon. He was elected a fellow of All Souls College in 1744, and in 1746 he became a barrister. Having taken a doctorate in civil law in 1750, he abandoned his legal practice in 1753 to concentrate on teaching and legal work around Oxford. He gave the first university lectures on English common law, publishing a synopsis for

students in 1756. He was elected to the first chair in common law, the Vinerian professorship at Oxford, in 1758. His classic Commentaries on the Laws of England (1765—69) is the best-known description of the doctrines of English law; it became the basis of university legal education in England and North America. He also served as a member of Parliament (1761-70), as solicitor general to the queen (from 1763), and as judge of the Court of Common Pleas (1770-80).

Blackstone River River, central Massachusetts and Rhode Island, U.S. It flows about 50 mi (80 km) past Worcester and across northeastern Rhode Island to Pawtucket, where it becomes the Seekonk River. It furnishes power to a highly industrialized area.

Blackwell, Elizabeth (b. Feb. 3, 1821, Counterslip, Bristol, Gloucestershire, Eng. — d. May 31, 1910, Hastings, Sussex) British-born U.S. physician. Her family immigrated to the U.S. in 1832. She began her medical education by reading medical books and hiring private instructors. Medical schools rejected her applications until she was accepted at

can Indian

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Male (bottom) and female blackcaps
(Sylvia atricapilla).

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Black fly (Simuliidae)

E.S. ROSS

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the Geneva Medical (later Hobart) College in 1847. Though ostracized, she graduated at the head of her class in 1 849, becoming the first woman doctor in modern times and the first to gain her degree from a U.S. medical school. In 1857, despite much opposition, she established the New York Infirmary, staffed entirely by women, and she later added a full course of medical education for women. She was also a founder of the London School of Medicine for Women. Her sister Emily (1826-1910) ran the infirmary for many years and served as dean and professor at the associated medical college.

Blackwell's Island See Roosevelt Island

bladder cancer Malignant tumour of the bladder. The most significant risk factor associated with bladder cancer is smoking. Exposure to chemicals called arylamines, which are used in the leather, rubber, printing, and textiles industries, is another risk factor. Most bladder cancers are diagnosed after the age of 60; men are affected more than women. Symptoms include blood in the urine, difficulty urinating, excessive urination, or, more rarely, painful urination. Bladder cancer can be treated with surgery, radiation therapy, or chemotherapy.

bladderwort Any of about 120 widespread species of terrestrial and aquatic carnivorous plants of the genus Utricularia (family Lentibulariaceae). They are characterized by small hollow sacs (bladders) that actively capture and digest tiny animals that touch them, including insect larvae, aquatic worms, water fleas, and other small swimmers. Closely related to the bladderworts are the butterworts (Pinguicula), 35 species of land plants that capture insects by means of sticky glands on the leaf surfaces.

Blaine, James G(illespie) (b. Jan. 31, 1830, West Brownsville, Pa., U.S. — d. Jan. 27, 1893, Washington, D.C.) U.S. politician and diplomat. He moved to Maine in 1854 to become editor of the Kennebec Journal , a crusading Republican newspaper. He served in the U.S. House of Representatives (1863-76), becoming speaker in 1868. An advocate of moderation in the Republican Party, he opposed the Radical Republicans led by Roscoe Conkling. Elected to the U.S. Senate in 1876, he resigned his seat in 1881 to become secretary of state. In this office he took the first steps toward securing U.S. control of the eventual route of the Panama Canal. As the Republican presidential candidate in 1884 he narrowly lost to Grover Cleveland. As secretary of state for a second time in 1889-92, he chaired the first Pan-American Conference.

Blair, Henry William (b. Dec. 6, 1834, Campton, N.H., U.S. — d. March 14, 1920, Washington, D.C.) U.S. politician. He practiced law from 1859 and served in the New Hampshire state legislature before being elected to the U.S. House of Representatives (1875-79) and Senate (1879-91). In 1876 he sought to give revenues from the sale of public lands to the nation’s schools, and in 1881 he proposed to “vitalize” the schools with a $ 120-million grant to the states; neither effort succeeded. He also advocated women’s rights and racial justice.

Blair, Tony orig. Anthony Charles Lynton (b. May 6, 1953, Edinburgh, Scot.) British politician who in 1997 became the country’s youngest prime minister since 1812. Blair was a lawyer before winning election to the House of Commons in 1983. Entering the shadow cabinet of the Labour Party in 1988 at age 35, Blair urged the party to move to the political centre and deemphasize its traditional advocacy of state control and public ownership of certain sectors of the economy. He assumed leadership of Labour in 1994 and revamped its platform. He led the party to victories in the 1997, 2001, and 2005 elections. His government brokered a peace agreement between unionists and republicans in Northern Ireland, introduced devolved assemblies in Wales and Scotland, and carried out reforms of Parliament. After the September 1 1 attacks on the U.S. in 2001, Blair allied the United Kingdom with the U.S. and its president, George W. Bush, in a global war against terrorism. In late 2002 Blair and Bush accused the Iraqi government of Saddam Hussein of continuing to possess and develop biological, chemical, and nuclear weapons in violation of UN

mandates. Despite deep divisions within his own party and strong public opposition to a war with Iraq, Blair, with Bush, led an attack on Iraq that toppled Hussein's regime in March-April 2003.

Blais Vble\, Marie-Claire (b. Oct. 5, 1939, Quebec, Que., Can.) French-Canadian novelist and poet. In two early, dreamlike novels, Mad Shadows (1959) and Tete blanche (1960), she staked out her territory, working-class people doomed to unrelieved sorrow and grinding poverty. A Season in the Life of Emmanuel (1965) received the Prix Medicis and

was widely translated and discussed. Later works include The Manuscripts of Pauline Archange (1968, Governor General's Award) and Deaf to the City (1979, Governor General's Award). She received the Governor General's Award again in 1996 for Soifs (1995). She has also published poetry collections and several plays.

Blake, Edward (b. Oct. 13, 1833, Adelaide, Upper Canada — d. March 1, 1912, Toronto, Ont., Can.) Canadian politician. Blake was called to the bar in 1856 and created a queen's counsel in 1864. In 1867 he was elected to the Canadian House of Commons. He served as premier of Ontario (1871-72) and minister of justice (1875-77) in Alexander Mackenzie's cabinet, helping draft the constitution. He was leader of the Liberal Party (1880-87). In 1890 he withdrew from Canadian politics and moved to Ireland, where he served in the British House of Commons (1892-1907).

Blake, Eubie orig. James Hubert Blake (b. Feb. 7, 1883, Baltimore, Md., U.S. — d. Feb. 12, 1983, Brooklyn, N.Y.) U.S. songwriter and pianist. He played piano in cafes and brothels as a teenager, and in 1 899 he composed his first ragtime song, "Sounds of Africa." He and his partner, lyricist and vocalist Noble Sissle (1889-1975), were among the first African American performers to appear onstage without minstrel makeup. Their show Shuffle Along (1921), which introduced Paul Robeson and Josephine Baker, was among the first musicals written, produced, and directed by African Americans. In 1925 Blake cowrote the score to Blackbirds of 1930. He achieved his greatest fame when the musical Eubie opened on Broadway (1978). He gave his last concert in 1982.

Blake, William (b. Nov. 28, 1757, London, Eng. — d. Aug. 12, 1827, London) English poet, painter, engraver, and visionary. Though he did not attend school, he was trained as an engraver at the Royal Academy and opened a print shop in London in 1784. He developed an innovative technique for producing coloured engravings and began producing his own illustrated books of poetry with his "illuminated printing," including Songs of Innocence (1789), The Marriage of Heaven and Hell (1793), and Songs of Experience (1794). Jerusalem (1804-20), his third major epic treating the fall and redemption of humanity, is his most richly decorated book. His other major works include The Four Zoas (1795-1804) and Milton (1804-08).

A late series of 22 watercolours inspired by the Book of Job includes some of his best-known pictures. He was called mad because he was single-minded and unworldly; he lived on the edge of poverty and died in neglect. His books form one of the most strikingly original and independent bodies of work in the Western cultural tradition. Ignored by the public of his day, he is now regarded as one of the earliest and greatest figures of Romanticism.

Blakelock, Ralph (b. Oct. 15, 1847, New York, N.Y., U.S.— d. Aug. 9, 1919, near Elizabethtown, N.Y.) U.S. painter. A self-taught artist, he developed a highly original and subjective style of landscape painting, characterized by luminous impasto images of moonlit scenes with nocturnal lighting and strangely dappled trees and foliage. Neglected by the public and constantly under the strain of poverty, he suffered a breakdown in 1899, ceased to paint, and spent the rest of his life in an asylum. During his confinement he achieved some fame, and forgeries of his work became common as his popularity rose.

Blakeslee, Albert Francis (b. Nov. 9, 1874, Geneseo, N.Y., U.S. — d. Nov. 16, 1954, Northampton, Mass.) U.S. botanist and geneticist. He received his Ph.D. from Harvard University. In his dissertation he became the first person to describe sexuality in the lower fungi. His later experimental work focused on higher plants. After a long tenure with the Carnegie Institution’s Cold Spring Harbor Laboratory (1915 — 41), he joined the faculty of Smith College, where he published a series of papers on the genetics and cell biology of jimsonweed. He used the alkaloid colchicine

William Blake, watercolour portrait by John Linnell; in the National Portrait Gallery, London.

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to achieve an increase in the number of chromosomes and thus opened up a new field of artificially produced polyploids.

Blakey, Art Abdullah Ibn Buhaina (b. Oct. 11, 1919, Pittsburgh, Pa., U.S. — d. Oct. 16, 1990, New York, N.Y.) U.S. jazz drummer and bandleader. He worked with Fletcher Henderson’s big band before joining Billy Eckstine’s forward-looking ensemble (1944-47). Blakey’ s prodigious technique and thunderous attack assured his role as one of the

principal drum stylists in modern jazz. With Horace Silver, Blakey formed the Jazz Messengers in 1954, and the group, with its aggressive blues-inflected approach, became the archetypal hard-bop unit (see bebop).

Blalock Vbla-JakV Alfred (b. April 5, 1899, Culloden, Ga., U.S.— d. Sept. 15, 1964, Baltimore, Md.) U.S. surgeon. He received an M.D. from Johns Hopkins University. His research, showing that traumatic and hemorrhagic shock resulted from loss of blood volume, led to volume-replacement treatment, which saved countless lives during World War II. He is remembered for his development, with Helen Brooke Taussig, of a surgical treatment for heart malformations in newborns. In 1944 he performed the first subclavian-pulmonary artery anastomosis operation, which corrected the birth defect.

1785. His balloon flights in other European countries and in the U.S. in 1793 spurred an interest in ballooning. He and his wife performed many exhibitions in Europe; they died in separate balloon accidents.

Blanchard Vblan-chordV, Thomas (b. June 24, 1788, Sutton, Mass., U.S. — d. April 16, 1864, Boston, Mass.) U.S. inventor. In 1818 he invented a lathe capable of turning irregular shapes, such as a gunstock. It duplicated the form of a pattern object by transmitting to the cutting tool the motion of a friction wheel rolling over the pattern. His invention was an essential step in the development of mass production techniques. He produced several successful designs of shallow-draft steamboats, and in 1849 he invented machinery for bending wood into complex shapes such as plow handles and ship’s frames.

Blanda, George (Frederick) (b. Sept. 17, 1927, Youngwood, Pa., U.S.) U.S. football player. He played for the University of Kentucky. As a professional quarterback and kicker, he played for the Chicago Bears (1949-58), Houston Oilers (1960-66), and Oakland Raiders (1967-76), setting still-standing records for most seasons played (26), most games played (340), and most points after touchdowns (943). His record for most field goals (335) was broken in 1983.

blank verse Unrhymed verse, specifically unrhymed iambic pentameter, the preeminent dramatic and narrative verse form in English. It is also the standard form for dramatic verse in Italian and German. Adapted from Greek and Latin sources, it was introduced in Italy, then in England, where in the 16th century William Shakespeare transformed blank verse into a vehicle for the greatest English dramatic poetry, and its potential for grandeur was confirmed with John Milton’s Paradise Lost (1667).

Blanqui \bla n -'ke\, (Louis-) Auguste (b. Feb. 1, 1805, Puget-Theniers, France — d. Jan. 1, 1881, Paris) French socialist and revolutionary. A legendary martyr-figure of French radicalism, Blanqui believed that there could be no socialist transformation of society without a temporary dictatorship that would eradicate the old order. His activities, including the formation of various secret societies, caused him to be imprisoned various times for a total of more than 33 years. His disciples, the Blanquists, played an important role in the history of the workers’ movement even after his death.

blanquillo See tilefish

Blanton, Jimmy orig. James Blanton (b. October 1918, Chatta-

nooga, Tenn., U.S. — d. July 30, 1942, Monrovia, Calif.) U.S. jazz musician. He joined Duke Ellington's orchestra as a string bass player in 1939. Blanton's buoyant rhythmic approach and harmonic subtlety provided a supple, relaxed sense of swing for the band. His unprecedented dexterity, tone, and intonation enabled him to execute a melodic conception of the role of the bass in jazz, demonstrated on recordings made with Ellington such as "Jack the Bear" and "Pitter Panther Patter." His revolutionary technique changed jazz bass playing and became the major influence on subsequent bassists. He died of tuberculosis.

Blantyre \blan-'tlr\ City (pop., 2003 est.: 646,235), southern Malawi. It is the largest city in Malawi and the seat of the country's judiciary. Blantyre was founded in 1876 as a Church of Scotland mission station and named after explorer David Livingstone's Scottish birthplace. It became a British consular post in 1883 and attained municipal status in 1895; it is Malawi's oldest municipality. Its colonial trade laid the foundation for its present importance as Malawi's chief commercial centre. In 1956 Blantyre was united with nearby Limbe.

Blarney Village (pop., 2002: 2,146), County Cork, Ireland. Situated northwest of the city of Cork, it is famous as the site of Blarney Castle (c. 1446). Below the battlements on the southern castle wall is the Blarney Stone, which in local legend is said to confer eloquence on anyone who kisses it.

Blasco Ibanez Vblas-ko-e-'ban-yathV Vicente (b. Jan. 29, 1867, Valencia, Spain — d. Jan. 28, 1928, Menton, France) Spanish writer and politician. An ardent republican, he was elected to the Cortes (parliament) but later settled on the French Riviera because of his opposition to the military dictatorship of Miguel Primo de Rivera. His early novels are primarily intense depictions of life in Valencia. He achieved world renown for his novels dealing with World War I, especially The Four Horsemen of the Apocalypse (1916).

Blasis \'bla-ses\. Carlo (b. Nov. 4, 1803, Naples, Kingdom of Naples — d. Jan. 15, 1878, Cernobbio, Italy) Italian ballet teacher and

Blanc \'bla n \, (Jean-Joseph-Charles-) Louis (b. Oct. 29, 1811, Madrid, Spain— d. Dec. 6, 1882,

Cannes, France) French utopian socialist and journalist. In 1839 he founded the socialist newspaper Revue du Progres and serially published his The Organization of Labour , which described his theory of worker-controlled "social workshops" that would gradually take over production until a socialist society came into being. He was a member of the provisional government of the Second Republic (1848) but was forced to flee to England after workers unsuccessfully revolted. In exile (1848-70), he wrote a history of the French Revolution and other politi-

cal works.

Louis Blanc.

H. ROGER-VIOLLET

Blanc \'blaqk\, Mel(vin Jer-
ome) (b. May 30, 1908, San Fran-
cisco, Calif., U.S.— d. July 10, 1989,

Los Angeles, Calif.) U.S. entertainer. He began his career as a musician on NBC radio, and in 1933 he joined a daily radio program, for which he created several voices to augment the cast. In 1937 he joined the cartoon department of Warner Brothers, and he took part in the development of Looney Tunes and Merrie Melodies, providing the voices of Porky Pig, Daffy Duck, Woody Woodpecker, and Bugs Bunny. In his 50-year career he supplied the voices for about 3,000 animated cartoons, including 90% of the Warner Brothers cartoons.

Blanc Vbla n \, Mont Italian
Monte Bianco Mountain massif,
Europe. Located in the Alps on the
borders of France, Italy, and Switzer-
land, it is Europe’s highest peak, at
15,771 ft (4,807 m). It was first
climbed in 1786 by Michel-Gabriel
Paccard and Jacques Balmat. Mont
Blanc Tunnel, 7.3 mi (11.7 km) long
and one of the longest vehicular tun-
nels in the world, connects France
with Italy. The region has become a
major tourist and winter sports cen-
tre.

Blanchard \bla n -'shar\, Jean-
Pierre-Francois (b. July 4, 1753,
Les Andelys, France — d. March 7,
1809, Paris) French balloonist. In
1785 he made the first aerial cross-
ing of the English Channel, accom-
panied by John Jeffries, a U.S.
doctor. He invented a parachute in

J.-P.-F. Blanchard, engraving by James
Newton, 1 785, after an oil painting by
Richard Livesay.

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writer on the technique, history, and theory of dance. He danced briefly at the Paris Opera before being appointed director of the ballet school at Milan's La Scala in 1837, where he would train many of the most brilliant dancers of the 19th century. Among his many innovations, Blasis discovered the technique of spotting (focusing on one spot and snapping one's head around faster than one's body) to prevent dizziness when turning. Many of his teachings still form the basis of classical ballet.

Blass, Bill (b. June 22, 1922, Ft. Wayne, Ind., U.S. — d. June 12, 2002, New Preston, Conn.) U.S. fashion designer. Blass left home at age 17 to attend the Parsons School of Design in New York City. After serving in the U.S. Army during World War II, he returned to New York, where in 1959 he became the head designer of Maurice Rentner, Ltd. Building upon the innovations of European designers such as Coco Chanel, Blass made clothes that allowed women a chic, modern sense of ease and comfort. His work became popular among New York high- society women. In 1970 Blass became owner of Rentner, which he renamed after himself. He was a pioneer in employing the business strategy of licensing his designs and name to a huge array of fashion accessories. In 1999 he sold his company, which continued as Bill Blass Ltd., and he retired the following year.

blast furnace Vertical shaft furnace that produces liquid metals by the reaction of air introduced under pressure into the bottom of the furnace with a mixture of metallic ore, fuel, and flux fed into the top. Blast furnaces are used to produce pig iron from iron ore for subsequent processing into steel; they are also employed in processing lead, copper, and other metals. The current of pressurized air maintains rapid combustion. Blast furnaces were used in China as early as 200 bc, and appeared in Europe in the 13th century, replacing the bloomery process. Modem blast furnaces are 70-120 ft (20-35 m) high, have 20^45-ft (6-14-m) health diameters, use coke fuel, and can produce 1,000-10,000 tons (900-9,000 metric tons) of pig iron daily. See also metallurgy, smelting.

Blaue Reiter \ I blau-9-'rI-t3r\, Der German "The Blue Rider" Organization of Expressionist artists formed in Munich in 1911 by Vasily Kandinsky and Franz Marc. The name derived from a volume of essays and illustrations they published. Other members included Paul Klee and August Macke (1887-1914). Influenced by Jugendstil, Cubism, and Futurism but lacking a specific program or philosophy, they exhibited with an international group, including Georges Braque, Andre Derain, and Pablo Picasso. The group disintegrated at the outbreak of World War I.

Blavatsky \bb-'vat-ske\, Helena (Petrovna) orig. Helena Petrovna Hahn known as Madame Blavatsky (b. Aug. 12, 1831, Yekaterinoslav, Ukraine, Russian Empire — d. May 8, 1891, London, Eng.) Russian spiritualist and writer. After a brief marriage, she studied occultism and spiritualism and traveled through Europe, Asia, and the U.S. In 1873 in New York City she became a close companion of Henry Olcott (1832-1907); they and others founded the Theosophical Society (1875; see theosophy). In 1879 Blavatsky and Olcott went to India and

established headquarters at Adyar. The society thrived, and she edited its journal. The Theosophist. She claimed psychic powers, but the London Society for Psychical Research in 1885 labeled her a fraud. In poor health, she returned to live in Europe. Her most important work, The Secret Doctrine (1888), was an overview of theosophical teachings.

bleach Solid or liquid chemical compound used to whiten or remove the natural colour of fibres, yams, paper, and textile fabrics. Sunlight was the chief bleaching agent up to the discovery of chlorine in 1774 by Karl Wilhelm Scheele (b. 1742 — d. 1786) and the demonstration of its bleaching properties in 1785 by Claude-Louis Berthollet (b. 1748 — d. 1822). In textile finishing, the bleaching process is used to produce white cloth, to prepare fabrics for other finishes, or to remove discoloration. Chlorine, sodium hypochlorite, calcium hypochlorite, and hydrogen peroxide are commonly used as bleaches.

bleeding heart Any of several species of Dicentra , a genus of herbaceous flowering plants of the fumitory family (Fumariaceae). The old garden favourite is the Japanese D. spectabilis, which has small rosy-red and white, heart-shaped flowers dangling from arching stems. The eastern, or wild, bleeding heart (D . eximia) produces sprays of small pink flowers from April to September in the Allegheny Mountains region of the U.S. The Pacific, or western, bleeding heart (D . formosa), ranging from California to British Columbia, has several varieties of garden interest.

Bleeding Kansas Term applied to a period of civil unrest (1854-59) between proslavery and antislavery advocates for control of the new Kansas Territory. Under the doctrine of popular sovereignty, antislavery emigrants from the North clashed with armed proslavery groups from Missouri. In 1856 a proslavery raid and burning of a hotel and newspaper in Lawrence were followed by several murders instigated by antislavery radicals under John Brown. Sporadic battles continued until Kansas was admitted to the Union as a free state in 1861.

blende See sphalerite

Blenheim \'ble-nim\. Battle of (Aug. 13, 1704) Famous victory of the duke of Marlborough and Eugene of Savoy against the French in the War of the Spanish Succession, fought at Blenheim (now Blindheim) on the Danube River in Bavaria. English and Austrian troops led by Marlborough and Eugene surprised the unprepared French and Bavarian forces, broke through their centre, and captured 13,000 of their troops; another 18,000 were killed, wounded, or drowned. The French army suffered its first major defeat in more than50 years, and Bavaria was removed from the war.

Blenheim Vble-nim\ Palace English residence near Woodstock, Oxfordshire, designed by John Vanbrugh and built (1705-24) by the British Parliament as a gift to John Churchill, duke of Marlborough. It is

regarded as the finest example of Baroque architecture in Britain. In the early 18th century Queen Anne’s gardener, Henry Wise, designed its grounds in the formal style of the Palace of Versailles; Capability Brown later redesigned them in his pastoral style, using natural-looking woods, lawns, and waterways.

blenny Any of numerous and diverse fishes (suborder Blenniodei, order Perciformes) that are mostly small, marine species found from tropical to cold seas. Blennies are slim, ranging from moderately elongated to very long and eel-like. Their habitats range from rocky pools to sandy beaches, reefs, and beds of kelp.

Many live in shallow water, but some range to depths of about 1 ,500 ft (450 m). Some are mainly herbivores; others are partial or complete carnivores. They are generally unobtrusive and of little economic importance.

Bleriot, Louis (b. July 1, 1872,

Cambrai, France— d. Aug. 2, 1936,

Paris) French aviator who made the first airplane flight across the English Channel between continental Europe and Great Britain. A successful manufacturer of automotive accessories, Bleriot also built and tested a variety of powered aircraft. On July 25, 1909, he piloted his Bleriot XI, a monoplane with a 28-horsepower engine, from Calais, France, to Dover, Eng., winning a prize of £1,000 and demonstrating the power of airplanes to overcome geographic barriers. Bleriot remained a leader of the aviation industry through World War I and in the immediate postwar decade.

Blessing Way Central ritual in the complex system of ceremonies performed by the Navajo to restore equilibrium to the cosmos. Of the major categories of Navajo rituals, the largest group is the Chant Ways, which are concerned with curing. The Chant Ways include a subgroup of chants called the Holy Ways, which are further divided into the Blessing Way and the Wind Ways (used to cure illness). Lasting for two days, the Blessing Way is a simple chant performed for the well-being of the community rather than for a specific curative purpose.

Bleuler Vbloi-br\, Eugen (b. April 30, 1857, Zollikon, Switz. — d. July 15, 1939, Zollikon) Swiss psychiatrist. He is best known for his studies of schizophrenia and for introducing (1908) the term for the disorder previously called dementia praecox. Bleuler argued (against accepted wisdom) that schizophrenia was more than one disease, was not always incurable, and did not always progress to full dementia. He described the basic symptoms — disordered mental associations and splitting or frag-

Bleeding heart (Dicentra spectabilis)

GRANT HEILMAN

Shanny (Blennius pholis), a common European blenny

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mentation of the personality — but believed that many cases were not apparent. He insisted that psychosis did not need to result from organic brain damage and could have psychological causes instead. His Textbook of Psychiatry (1916) became a standard text.

Bligh, William (b. Sept. 9, 1754, county of Cornwall, Eng. — d. Dec. 7, 1817, London) English admiral. He went to sea at the age of seven and joined the Royal Navy in 1770. After serving as the sailing master on Capt. James Cook's final voyage (1776-80), he was named to command the HMS Bounty in 1787. While en route from Tahiti to Jamaica, the ship was seized by Fletcher Christian, the master's mate, and Bligh and loyal crew members were set adrift; some two months later, they reached Timor. The mutiny made little difference to Bligh' s career, though he had two more encounters with mutineers, including one while he was governor of New South Wales, Australia (1805-08). Described as overbearing, he was unpopular as a commander but was also courageous and a greatly skilled navigator.

blight Any of various plant diseases whose symptoms include sudden and severe yellowing, browning, spotting, withering, or dying of leaves, flowers, fruit, stems, or the entire plant. Usually the shoots and other young, rapidly growing tissues of a plant are attacked. Most blights are caused by bacteria or fungi (see fungus); some result from drought. Fungal and bacterial blights are most likely under cool, moist conditions. Most economically important plants are susceptible to one or more blights. Measures taken to fight blight include destroying the infected plant parts; using disease-free seed or stock and resistant varieties; rotating crops (see crop rotation); pruning and spacing plants for better air circulation; controlling pests that carry the fungus from plant to plant; avoiding overhead watering and working among wet plants; and, where needed, applying fungicides or antibiotics. Maintaining sanitary conditions is the most important measure for stopping the spread of the infestation. See also chestnut blight.

blind fish Any of various species of sightless fishes, among them several unrelated cave-dwelling species. Blind cave fishes are pale and small, growing to about 4 in. (10 cm) long, and are found in dark limestone caves of the U.S. All have small but nonfunctional eyes and tactile organs that are sensitive to touch, allowing the fish to feel what it cannot see. Other

cave-dwelling fishes tending toward blindness are found in Cuba, Mexico's Yucatan, South America, and Africa.

blindness Inability to see with one or both eyes. Transient blindness (blackout) can result from vertical acceleration causing high gravitational forces, glomerulonephritis (a kidney disease), or a clot in a blood vessel of the eye. Continuing blindness may arise from injuries or diseases of the eye (e.g., cataract, glaucoma), including the retina, the optic nerve, or the brain's visual centres. Many infectious, noninfectious, and parasitic systemic diseases can cause blindness. Sexually transmitted diseases and rubella in pregnant women can cause blindness in their infants. See also MACULAR DEGENERATION; VISUAL- FIELD DEFECT.

Bliss, Sir Arthur (Edward Drummond) (b. Aug. 2, 1891, London, Eng. — d. March 27, 1975, London) British composer. He studied with Ralph Vaughan Williams and Gustav Holst. Though he was compositionally adventurous at first, he later adopted a conservative, Romantic style. His works include A Colour Symphony (1922), Pastoral (1928), the choral symphony Morning Heroes (1930), Music for Strings (1936), and the ballets Checkmate (1937) and Miracle in the Gorbals (1944).

Bliss, Tasker (Howard) (b. Dec. 31, 1853, Lewisburg, Pa., U.S. — d. Nov. 9, 1930, Washington, D.C.) U.S. general. After attending West Point (1875), he served in various military assignments, including that of instructor at West Point and military attache at the U.S. legation in Madrid. In the Spanish-American War, he was chief of staff under Gen. James H. Wilson in Puerto Rico; he later served in the Philippines (1905-09). As army chief of staff in 1917, he made the U.S. Army battle-ready for World War I and resisted attempts to divide the force among the various Allied commands. He was a delegate to the Paris Peace Conference and an ardent supporter of U.S. participation in the League of Nations.

Bliss, William D(wight) P(orter) (b. Aug. 20, 1856, Constantinople, Tur. — d. Oct. 8, 1926, New York, N.Y., U.S.) U.S. social reformer. The son of U.S. missionaries, he graduated from Hartford Theological Seminary and held Congregationalist and Episcopalian pastorates. An advocate of Christian socialism, he organized the first such group in the U.S. in 1889. He lectured widely on labour and social reform and compiled many books, including the Encyclopedia of Social Reform (1897).

blister Rounded skin elevation in which fluid fills a separation between layers of epidermis or between the epidermis and the dermis. The fluid is usually clear; yellowish fluid contains pus, and red fluid contains blood. Blisters often occur on the palms or soles when pressure and friction cause an upper skin layer to move back and forth over the one under it. A small gap opens between them and becomes filled with fluid. This type generally heals spontaneously, sometimes leaving a thickened callus. Blisters that occur as symptoms of contact dermatitis, viral infection, or autoimmune disease can appear anywhere on the body and may leave scars.

blister beetle Any of approximately 2,000 species of beetles (family Meloidae) that secrete an irritating substance, cantharidin, which is used medically as a topical skin irritant to remove warts. In the past, cantharidin was often used to induce blisters, a common remedy for many ail-

ments, and the dried remains of Spanish fly (Lytta vesicatoria) were a major ingredient in so-called love potions. Adult blister beetles, which are often brightly coloured, range between 0.1 and 0.8 in. (3-20 mm) in length. Blister beetles are both helpful and harmful to humans; the larvae eat grasshopper eggs, but the adults destroy crops.

blister rust Any of several diseases of pines, caused by rust fungi (see fungus) of the genus Cronartium. Blister rust affects sapwood (see wood) and inner bark and produces external blisters from which additional spores of the fungus are released and resin oozes, forming characteristic hardened masses on the trunk. It affects pines of all ages and sizes, retarding growth and weakening stems as it spreads along the trunk, sometimes killing the tree; young trees are killed more quickly than older ones. Measures taken to fight blister rust include growing resistant varieties, destroying nearby alternative host plants, observing strict sanitation measures, and spraying with fungicides.

blitzkrieg Vblits-,kreg\ (German: “lightning war”) Military tactic used by Germany in World War II, designed to create psychological shock and resultant disorganization in enemy forces through the use of surprise, speed, and superiority in materiel or firepower. The Germans tested the blitzkrieg during the Spanish Civil War in 1938 and against Poland in 1939, and used it in the successful invasions of Belgium, the Netherlands, and France in 1940. The German blitzkrieg coordinated land and air attacks — using tanks, dive-bombers, and motorized artillery — to paralyze the enemy principally by disabling its communications and coordination capacities.

Blitzstein Vblit-.stlnV Marc (b. March 2, 1905, Philadelphia, Pa., U.S. — d. Jan. 22, 1964, Fort-de-France, Martinique) U.S. composer. He studied at the Curtis Institute, then with the conductor Nadia Boulanger in Paris and the composer Arnold Schoenberg in Berlin. His best-known works were for the theatre: The Cradle Will Rock (1937), the circumstances of whose production by Orson Welles and John Houseman became legendary; the opera Regina (1949); and his English adaptation of Bertolt Brecht and Kurt Weill’s The Threepenny Opera (1952), which became a Broadway hit. He was working on a Metropolitan Opera commission for an opera about the Sacco- Vanzetti case when he was murdered.

Blobel, Gunter (b. May 21, 1936, Waltersdorf, Silesia, Ger.) U.S. cellular and molecular biologist. He earned his M.D. from Eberhard-Karl University and his Ph.D. from the University of Wisconsin. Working in collaboration with other research groups, Blobel showed that each protein carries a signal sequence that directs it to the proper location inside the cell. He also concluded that proteins enter organelles through a pore-like channel that opens in the organelle’s outer membrane when the correct protein arrives at the organelle. For his work, Blobel was awarded a Nobel Prize in 1999. His research shed light on such hereditary diseases as cystic fibrosis and provided the basis for bioengineered drugs, including INSULIN.

Bloc National Vblok-nas-yo-'naU Right-wing coalition that controlled the French government from 1919 to 1924. On a wave of nationalist sentiment at the end of World War I, the Bloc gained about 75% of the seats in the French Chamber of Deputies in the 1919 elections. The government

tried to ensure French security against Germany through a strict enforcement of the Treaty of Versailles. Its leaders, including Raymond Poincare,

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supported the Ruhr occupation (1923) to force Germany to pay reparations. It gradually lost public support, and it was defeated in the 1924 elections.

Bloch VblokA, Ernest (b. July 24, 1880, Geneva, Switz. — d. July 15, 1959, Portland, Ore., U.S.) Swiss-born U.S. composer. He conducted and lectured at the Geneva Conservatory before moving in 1916 to the U.S., where he served as director of the San Francisco Conservatory (1925-30) and taught at the University of California, Berkeley (1942-52). He worked in tonal, atonal, and serialist idioms (see also tonality; atonality; serialism); his works, many of them inspired by Jewish themes, include the opera Macbeth (1910), Schelomo for cello and orchestra (1916), the large choral works America (1926) and Avodath hakodesh (1933), and a violin concerto (1938).

Bloch Vblak\, Felix (b. Oct. 23, 1905, Zurich, Switz.— d. Sept. 10, 1983, Zurich) Swiss-born U.S. physicist. He emigrated to the U.S. in 1933 and taught at Stanford University (1934-71). He worked on atomic energy at Los Alamos and on radar countermeasures at Harvard University during World War II. In 1954 he became the first director general of CERN. For developing the nuclear magnetic resonance method of measuring the magnetic fields of atomic nuclei, he shared with Edward Purcell (1912—97) the 1952 Nobel Prize for Physics.

Bloch Vblok\, Marc (Leopold Benjamin) (b. July 6, 1886, Lyon, France — d. June 16, 1944, near Lyon) French historian. He served in the French infantry in World War I. From 1919 he taught medieval history at the University of Strasbourg, where he cofounded the important periodical Annates d'histoire economique et sociale. He taught economic history at the Sorbonne from 1936. During World War II he joined the French Resistance and was captured and killed by the Germans. Among his major works are The Royal Touch (1924), French Rural History (1931), and Feudal Society (1939). As the founder of the Annales school of historiography, with its wide-ranging, interdisciplinary approach, Bloch exerted a huge influence on the study of history.

block and tackle Combination of pulleys with a rope or cable, commonly used to augment pulling force. Two or more of the pulleys are attached to a fixed block, and the remaining pulleys are free to move as well as rotate. A block and tackle can be used to lift heavy weights or to exert large forces in any direction. Higher force ratios may be obtained by the use of more pulleys, but this advantage may be offset by increased friction.

Block Island Island, Rhode Island, U.S. It lies at the eastern entrance

to Long Island Sound, 9 mi (15 km) southwest of Point Judith, R.I. It has an area of about 11 sq mi (29 sq km) and is coextensive with the town of New Shoreham (pop., 2000: 1,010). Called Manisses by its original Indian inhabitants. Block Island (named for the Dutch explorer Adriaen Block) received its first European settlers in 1661 and was admitted to the colony of Rhode Island in 1664. Once dependent on fishing and farming, it is now primarily a resort.

block mill Earliest mechanized factory for mass production. It was conceived by Samuel Bentham, with machinery designed by Marc Brunel and built by Henry Maudslay, and built at England's Portsmouth naval dockyard. By 1805 it was producing 130,000 pulley blocks per year. It remained in production for over 100 years. See also American System of MANUFACTURE.

blockade Act of war whereby one party blocks entry to or departure from an enemy area, often a coast. Blockades are regulated by international law and custom, which require advance warning to neutral states and impartial application. Penalties for breach of blockade are seizure of ship and cargo and their possible condemnation as lawful prizes. Neutral ships may not be destroyed for blockade running.

Bloemfontein Vblum-.fan-.tanN City (pop., 2005 est.: 379,000), judicial capital of the Republic of South Africa. It is also the capital of Free State province. Founded in 1846 as a fort, it became the seat of the British-administered Orange River Sovereignty (1848-54) and later that of Orange Free State, an independent Boer republic formed in 1854. The failure of the Bloemfontein Conference (1899) resulted in the outbreak of the South African War. In the 20th century the city became a geographical transportation hub. Bloemfontein became part of the Mangaung Local Municipality in 2000. See also Pretoria; Cape Town.

Blok, Aleksandr (Aleksandrovich) (b. Nov. 28, 1880, St. Petersburg, Russia — d. Aug. 7, 1921, Petrograd [St. Petersburg]) Russian poet and dramatist. He was the principal representative of Russian Symbolism

(see Symbolist movement). He later rejected what he termed their sterile bourgeois intellectualism and embraced the Bolshevik movement as essential for the redemption of the Russian people. Influenced by early 19th-century Romantic poetry, he wrote musical verse in which sound was paramount. His preeminent work of impressionistic verse was the enigmatic ballad The Twelve (1918), which united the Russian Revolution and Christianity in an apocalyptic vision. In the era of postrevolutionary hardship he declined into mental and physical illness, possibly brought on by venereal disease, and died at 40.

Blondin \blo n -'da n ,\ English \'blan-den\ orig. Jean-Francois Gravelet (b. Feb. 28, 1824 , Hesdin, Fr. — d. Feb. 22, 1897, Little Ealing, near London, Eng.) French tightrope walker. After training as an acrobat, he achieved fame, first in 1859, with his many crossings of Niagara Falls on a tightrope 1,100 ft (335 m) long, 160 ft (48 m) above the water. Each time he used a different theatrical variation: blindfolded, in a sack, trundling a wheelbarrow, on stilts, carrying a man on his back, and sitting down midway to cook an omelette. He gave his last performance in 1896.

blood Circulatory fluid (see circulation) in multicellular animals. In many species it also carries hormones and disease-fighting substances.

Blood picks up oxygen from the lungs and nutrients from the gastrointestinal tract and carries them to cells throughout the body for metabolism. It picks up carbon dioxide and other wastes from those cells and transports them to the lungs and excretory organs. Blood composition varies among species. Mammalian blood consists of plasma, red and white cells (erythrocytes and leukocytes), and platelets (thrombocytes). Blood disorders include polycythemia (abnormal increase in the number of circulating red blood cells), anemia, leukemia, and hemophilia. See also ABO blood-group system; blood analysis; blood bank; blood pressure; blood transfusion; blood typing; Rh blood-group system.

blood analysis Laboratory examination of the physical and chemical properties and components of a sample of blood. Analysis includes number of red and white blood cells (erythrocytes and leukocytes); red cell volume, sedimentation (settling) rate, and hemoglobin concentration; blood typing; cell shape and structure; hemoglobin and other protein structure; enzyme activity; and chemistry. Special tests detect substances characteristic of specific infections.

blood bank Organization that collects, stores, processes, and supplies blood. Most blood donations are separated into components, which can be frozen and stored longer than whole blood and used by multiple patients. In hemapheresis, large amounts of one component can be separated from a single donor’s blood and the rest returned to the donor. Before World War I, a physician had to find a compatible donor and give an immediate blood transfusion. Safe storage of blood and its components made possible innovations such as heart-lung machines.

blood poisoning See septicemia

blood pressure Force originating when the heart’s pumping pushes the blood against the walls of the blood vessels. Their stretching and contraction help maintain blood flow. Usually measured over an arm or leg artery in humans, blood pressure is expressed as two numbers; normal adult blood pressure is about 120/80 mm of mercury. The higher number (systolic) is measured when the heart’s ventricles contract and the lower (diastolic) when they relax. See also hypertension, hypotension.

blood transfusion Transfer of blood taken from one person into the circulation of another to restore blood volume, increase hemoglobin levels, or combat shock. Once the blood-group antigens and antibodies (see ABO blood-group system, Rh blood-group system) were discovered, BLOOD typing of donors and recipients rendered transfusion safe. In exchange transfusion, all or most of the blood is removed and replaced with another’s blood. Undesirable reactions to transfusion are not uncommon.

blood typing Classification of blood by inherited antigens associated with erythrocytes (red blood cells). The ABO blood-group system and Rh blood-group system are among those most commonly considered. Without identification of these factors, blood transfusion from an incompatible donor may result in destruction of red cells or coagulation. Blood typing also helps identify disorders such as erythroblastosis fetalis.

bloodhound Breed of dog superior to any other in scenting ability, the foundation breed of most scent-hunting hound breeds. They were known, although not in the present form, in the Mediterranean area in pre-Christian times. Calm and affectionate, they are often used to track ani-

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mals and trail persons. A large, strong dog, the bloodhound stands 23-27 in. (58-69 cm) and weighs 80-110 lb (35-50 kg). It has short hair and long ears, with loose skin that falls into folds and wrinkles around the head and neck. The coat is black-and-tan, red-brown and tan, or tawny.

Bloodless Revolution See Glorious Revolution

bloodroot Plant (Sanguinaria canadensis) of the poppy family, native throughout eastern and midwestern North America, growing mainly in deciduous woodlands and blooming in early spring. The white, cup-shaped flower with bright yellow stamens in the centre is borne on a reddish stalk. Large, veiny, half-opened leaves on red stalks enfold the flower stem and, after the flower has bloomed, open into multilobed, round, blue-green leaves. The orange-red sap, once used by American Indians for dye, is found in the rhizomes, as is the medical alkaloid sanguinarine. The species, particularly the variety S. canadensis ‘Multiplex,’ which has showy double flowers, is an interesting plant for the wild garden.

Bloody Sunday (1905) Massacre of peaceful demonstrators in Saint Petersburg, marking the beginning of the Russian Revolution of 1 905. The priest Georgy Gapon (1870-1906), hoping to present workers’ request for reforms directly to Nicholas II, arranged a peaceful march toward the Winter Palace. Police fired on the demonstrators, killing more than 100 and wounding several hundred more. The massacre was followed by strikes in other cities, peasant uprisings, and mutinies in the armed forces. The term “Bloody Sunday” was also used to describe the murder in Dublin, Ireland (Nov. 21, 1920), of 11 Englishmen suspected of being intelligence agents, by the Irish Republican Army; the Black and Tans took revenge and attacked spectators at a football (soccer) match, killing 12 and wounding 60. The term was used again in Londonderry (Derry) when on Jan. 30, 1972, 3 participants in a civil rights march were killed by British soldiers, who allegedly had been fired on by the marchers.

Bloom, Harold (b. July 11, 1930, New York, N.Y., U.S.) U.S. literary critic. Bloom studied at Cornell and Yale universities and taught at Yale from 1955. In The Anxiety of Influence (1973) and A Map of Misreading (1975) he suggested that poetry results from poets deliberately misreading the works that both influence and threaten them. In The Book of J (1990) he speculated that the earliest known biblical texts were written by a woman with principally literary intentions. His best-selling The West-

ern Canon (1994) identifies 26 canonical Western writers and argues against the politicization of literary study.

Bloomer, Amelia orig. Amelia Jenks (b. May 27, 1818, Homer, N.Y., U.S. — d. Dec. 30, 1894, Council Bluffs, Iowa) U.S. reformer. In 1840 she married Dexter Bloomer, a Quaker newspaper editor. She wrote articles on education, unjust marriage laws, and women's suffrage and published the biweekly Lily (1849-54). Among her interests was dress reform, and the full trousers that she wore came to be known as bloomers. Her costume generated considerable publicity and helped to attract large crowds to her lectures in New York City, where she often shared the platform with Susan B. Anthony and the Rev. Antoinette L. Brown.

bloomery process Process for iron smelting. In ancient times, smelting involved creating a bed of red-hot charcoal in a furnace to which iron ore mixed with more charcoal was added. The ore was chemically reduced (see oxidation-reduction), but, because primitive furnaces could not reach the melting temperature of iron, the product was a spongy mass of pasty globules of metal intermingled with a semiliquid slag. This hardly usable product, known as a bloom, may have weighed up to 10 lbs (5 kg). Repeated reheating and hot hammering eliminated much of the slag, creating wrought iron, a much better product. By the 15th century, many bloomeries used low shaft furnaces with waterpower to drive the bellows, and the bloom, which might weigh over 200 lbs (100 kg), was extracted through the top of the shaft. The final version of this kind of bloomery hearth survived in Spain until the 19th century. Another design, the high bloomery furnace, had a taller shaft and evolved into the Stiickofen, which produced blooms so large they had to be removed through a front opening.

Bloomfield, Leonard (b. April 1, 1887, Chicago, 111., U.S. — d. April 18, 1949, New Haven, Conn.) U.S. linguist. He began his career as a philologist trained in Indo-European, especially Germanic languages. He taught Germanic philology at the University of Chicago (1927 — 40) and linguistics at Yale (1940-49). In Language (1933), one of the clearest 20th-century presentations of linguistics, he advocated the study of linguistic phenomena in isolation from their nonlinguistic environment and emphasized the need for empirical description. His thinking was influenced by his work on non-Indo-European languages, particularly the Algonquian family; The Menomini Language (1962) is a paragon of linguistic description and American Indian linguistic scholarship.

Bloomsbury group A coterie of English writers, philosophers, and artists. The name was a reference to the Bloomsbury district of London, where between about 1907 and 1930 the group frequently met to discuss aesthetic and philosophical questions. Among the group were E.M. Forster, Lytton Strachey, Clive Bell, the painters Vanessa Bell (1879-1961) and Duncan Grant (1885-1978), John Maynard Keynes, the Fabian writer Leonard Woolf (1880-1969), and Virginia Woolf.

Blount VblontV, William (b. March 26, 1749, Bertie county, N.C. — d. March 21, 1800, Knoxville, Tenn., U.S.) U.S. politician. He served in the American Revolution before being elected to six terms in the North Carolina legislature. He was a delegate to the Constitutional Convention. As the first governor of lands ceded to the U.S. by North Carolina, he worked to secure statehood for what would become Tennessee. In 1796 he became one of Tennessee's first two senators, but he was expelled from the Senate in 1797 on charges of plotting to help the British gain control of Span-

ish Florida and Louisiana.

Blow, John (baptized Feb. 23, 1649, Newark-on-Trent, Nottingham-shire, Eng. — d. Oct. 1, 1708, Westminster, London) British composer, organist, and teacher. He was appointed organist at Westminster Abbey in 1668; in 1774 he became master of the children at the Chapel Royal, and he later held various equally prominent posts, in which he influenced many students, including composer Henry Purcell. Of the many religious and secular ceremonial works he wrote in his official capacities, about 12 services and more than 100 anthems survive. His court masque Venus and Adonis (1685) represents a landmark in the development of English opera.

blowfish See puffer

blowfly Any member of the dipteran family Calliphoridae, including the screwworm and the bluebottle, greenbottle, and cluster flies. Metallic blue, green, or bronze, and noisy in flight, blowflies resemble the housefly in size and habits. The larvae usually feed on decaying flesh and sometimes infest open wounds. They may help prevent infection by cleaning away dead flesh, but may also destroy healthy tissue. Blowflies were once used to treat gangrene and a human bone disease and were used in World War I to clean soldiers' wounds. Some species seriously hurt or kill livestock by massive infestation or by carrying diseases such as anthrax, dysentery, and jaundice.

blowgun Long, narrow pipe through which darts or other projectiles are blown. Primarily a hunting weapon, it is rarely used in warfare. It has been used by aboriginal peoples in Malaysia and elsewhere in South Asia, southern India and Sri Lanka, Madagascar, northwestern South America, and Central America. Blowguns vary in length from 18 in. to more than 23 ft (45 cm to 7 m) and are often made of cane or bamboo. Darts are usually made of palm-leaf midribs or wood or bamboo splinters 1 .5-40 in. (4-100 cm). The dart must fit the tube snugly, so that a puff of human breath will cause it to fly from the tube. To be effective against quarry larger than small birds, blowgun darts require poison.

blowing engine Machine for pumping air into a furnace. Bellows driven by a waterwheel were the earliest form of blowing engine, later replaced by reciprocating pumps driven by steam or gas engines and by turbo-blowers. A modem blast furnace requires an enormous blowing engine.

Blucher Vblii-koiA, Gebhard Leberecht von, prince von Wahlstatt \'val-,shtat\ (b. Dec. 16, 1742, Rostock, Mecklenburg — d. Sept. 12, 1819, Krieblowitz, near Kanth, Silesia, Prussia) Prussian military leader. He joined the Prussian army in 1760 and commanded troops against the French (1793-94) and in the Napoleonic Wars. In 1813 he came out of retirement to command Prussian troops against the French, defeating them at Wahlstatt and assisting in the allied victory at the Battle of Leipzig. In 1815 he again commanded Prussian forces in the Battle of

Bloodroot (Sanguinaria canadensis)

WALTER CHANDOHA

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Waterloo, coordinating his army with the allied forces under the duke of Wellington to bring about Napoleon’s defeat.

blue (butterfly) Any member of the widely occurring lepidopteran family Lycaenidae. Adults, sometimes known as gossamer-winged butterflies, are small and delicate, with a wingspan of 0.75-1.5 in. (18-38 mm). Blues are rapid fliers, and most species have iridescent wings. Larvae are short, broad, and sluglike. Some species secrete honeydew, a sweet by-product of digestion that attracts ants, which stroke the larvae with their legs to stimulate honeydew secretion.

blue asbestos See crocidolite

blue crab Any member of a genus (Callinectes) of decapods, particularly C. sapidus and C. hastatus, common edible crabs of the western Atlantic coast prized as delicacies. Their usual habitats are muddy shores, bays, and estuaries. The blue crab shell, greenish on top and dingy white below, is about 3 in. (15-18 cm) long. The legs are bluish. The chelae, or pincers, are large and somewhat unequal in size, and the fifth pair of legs is flattened for swimming. Blue crabs are scavengers.

blue-green algae See cyanobacteria

blue ground See kimberlite

blue law U.S. statute regulating work, commerce, and amusements on Sundays. The name is said to derive from a list of Sabbath regulations published (on blue paper or in blue wrappers) in New Haven, Conn., in 1781. Throughout colonial New England such laws regulated morals and conduct. Most lapsed after the American Revolution, but some, such as prohibitions against the Sunday sale of alcoholic beverages, remain on the books in some areas.

Blue Mountains Plateau region, part of the Great Dividing Range, southeastern Australia. Located in New South Wales, the region rises to about 3,600 ft (1,100 m). Once used as a retreat by wealthy Sydney residents, it is now accessible by good roads and is a popular tourist area; the Blue Mountains area was designated a UNESCO World Heritage site in 2000. The city of Blue Mountains (pop., 2004 est.: 77,011) was incorporated in 1947.

Blue Mountains Mountain range, eastern Jamaica. It extends from north of Kingston eastward 30 mi (50 km) to the Caribbean Sea. Its highest point is Blue Mountain Peak, at 7,388 ft (2,252 m). It experiences heavy rain and widely divergent temperatures. Blue Mountain coffee is famous for its excellent quality.

Blue Nile See Nile River

Blue Ridge or Blue Ridge Mountains Section of the Appalachian Mountains, eastern U.S. The range extends southward from Carlisle, Pa., through parts of Maryland, Virginia, North Carolina, and South Carolina to Mt. Oglethorpe in Georgia. The highest peaks are in the Black Mountains of North Carolina; the average elevation is 2,000-4,000 ft (600-1,200 m). The scenic Blue Ridge Parkway, established in 1936 and administered by the National Park Service, runs 469 mi (755 km) along the crest.

blue whale Mottled, blue-gray baleen whale (Balaenoptera musculus), also called sulfur-bottom whale because of the yellowish diatoms on some individuals. The largest of all animals, the blue whale reaches a maximum length of about 100 ft (30 m) and a maximum weight of 150 tons (136,000 kg). It is found alone or in small groups in all oceans. In summer it feeds on krill in polar waters, and in winter it moves toward the equator to breed. It was once the most important of the commercially hunted baleen whales, and its populations were greatly reduced. Listed as an endangered species, it is now protected.

Bluebeard or Gilles de Rais \zhel-do-'ra\ or Gilles de Retz (b.

Sept./Oct. 1404, Champtoce, Fr. — d. Oct. 26, 1440, Nantes) Baron and marshal of France renowned for his cruelty. His name was later connected with the story “Bluebeard” by Charles Perrault. He fought several battles at the side of St. Joan of Arc and was made marshal of France (1429).

Back in Brittany he led a dissipated life and eventually turned to alchemy and satanism. Accused of abducting and murdering more than 140 children, he was tried by ecclesiastical and civil courts. Condemned for heresy, he confessed, repented, and died bravely at the gallows; his body was burned. Skeptics have noted irregularities in the trials and the interest of others in his ruin. The fairy-tale Bluebeard takes a wife, who, curious about the one room of the castle to which he denies her the key, discovers there the skeletons of her predecessors.

bluebell Any plant of the genus Endymion , in the lily family, native to Eurasia. Bluebell, or wild hyacinth (E. nonscriptus), and Spanish bluebell (E . hispanicus), bearing clusters of bell-shaped blue flowers, are cul-

tivated as garden ornamentals; some authorities place them in the related genus Scilla of the same family.

Many other plants are commonly known as bluebells, including species of the genera Campanula, Eustoma, Polemonium , and Clematis. In the U.S. the name bluebell is usually reserved for Mertensia virginica.

blueberry Any of several shrubs, native to North America, of the genus Vaccinium in the heath family.

They are prized for their sweet edible fruits, a source of vitamin C and iron.

Blueberries grow only in highly acidic and well-drained but moist soils. The highbush blueberry (V corymbosum), economically and ornamentally the most important species, is in the U.S. cultivated primarily in Maine, New Jersey, southwestern Michigan, and eastern North Carolina.

bluebird Any of three North American bird species (songbird genus Sialia) of the chat-thrush group. The eastern bluebird (S . sialis), which is 5.5 in. (14 cm) long, and the western bluebird (S. mexicana) are red-breasted forms found east and west of the Rockies, respectively. The mountain bluebird (S . currucoides), also found in the West, is all blue. Bluebirds arrive from the south in earliest spring. They live in open country and woodlands and nest in holes in trees or in fence posts and bird boxes.

bluebonnet Any of several flowering plants, including the Texas bluebonnet (Lupinus subcarnosus), a North American annual legume native to the plains of Texas. About 1 ft (0.3 m) tall, it bears silky-haired compound leaves and clusters of purplish blue flowers marked in the centre with white or yellow. In the spring it covers immense areas in southern and western Texas like a blue carpet. It is one of the most popular wildflowers of Texas. In Scotland the name is given to the bluebottle (Centaurea cyanus) and to the blue scabious, or devil’s bit (Succisa pratensis).

JOHN H. GERARD FROM THE NATIONAL AUDUBON SOCIETY COLLECTION/PHOTO RESEARCHES-EB INC.

Bluebeard, illustration by Gustave Dore

COURTESY OF THE TRUSTEES OF THE BRITISH MUSEUM; PHOTOGRAPH, J.R. FREEMAN & CO., LTD.

Wild hyacinth (Endymion nonscriptus)

M.T. TANTON-THE NATIONAL AUDUBON SOCIETY COLLECTION/PHOTO RESEARCHERS

Blueberry.

GRANT HEILMAN— EB INC.

Western bluebird (Sialia mexicana)

HERBERT CLARKE

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bluefish Swift-moving food and game fish (Pomatomus saltatrix) found throughout warm and tropical regions of the Atlantic and Indian oceans. It lives in schools and is a voracious predator of smaller animals, especially other fishes. It is slender and has a forked tail and a large mouth with strong, pointed teeth. It is blue or greenish and grows to a length of about 4 ft (1.2 m) and a weight of 25 lbs (11.5 kg).

bluegill Popular game fish (Lepomis macrochirus) and one of the best-known sunfishes throughout its original range, the freshwater habitats of the central and southern U.S. It has been introduced throughout the western U.S. and in other parts of the world. Bluegills are usually bluish or greenish and have a characteristic dark flap at the rear of the gill cover. Among the smallest of the food and game fishes, they normally are only 6-9 in. (15-23 cm) long and weigh less than 0.5 lbs (0.25 kg). Bluegills are known as highly spirited fighters on the end of a fishing line.

bluegrass Any of many slender annual and perennial lawn, pasture,

and forage GRASSes of the genus Poa, in the family Poaceae, or Gramineae. About 250 species are found in temperate and cool climates, more than 50 in the U.S. Most have small spikelets lacking bristles and arranged in open clusters. The narrow leaf blades have boat-shaped tips. With its blue-green leaves, Kentucky bluegrass (P. pratensis), the best-known U.S. species, is a popular lawn and pasture grass in the northern states and is common in open areas and along roadsides. Texas bluegrass (P. arachnifera), mutton grass (P. fendleriana), and plains bluegrass (P arida) are important western forage grasses. Annual bluegrass (P. annua), a small, light green species, is considered a pest in lawns.

bluegrass In music, a country-music style that emerged after World War II. It is a direct descendant of the string-band music played by groups such as the Carter Family. Bluegrass is distinguished from its predecessors by its more syncopated rhythm, its high-pitched tenor (lead) vocals, its tight harmonies, its driving rhythms, and a strong influence of jazz and blues. A very prominent place is given to the banjo, always played in the unique three-finger style developed by Earl Scruggs (see Lester Flatt). Mandolin and fiddle are generally featured, and traditional square-dance tunes, religious songs, and ballads furnish much of the repertory. Bluegrass was originated by and got its name from Bill Monroe and his Blue Grass Boys. From the late 1940s on, it continued to grow in popularity; from the 1970s an influx of younger musicians brought some influence from rock music.

Bluegrass region Area of central Kentucky, U.S. The region contains Kentucky’s best agricultural land and thus became the first area to be settled. It became known for its abundant bluegrass and became famous for breeding fine horses; the calcium-rich soil imparts its minerals to the grass and thence into the horses’ bones.

blues Secular musical form incorporating a repeating harmonic structure with melodic emphasis on the flatted or “blue” third and seventh notes of the scale. The specific origins of the blues are not known, but elements of the music of former slaves include the call-and-response pattern and syncopated rhythms of spirituals and work songs. The codification of the structure of the blues occurred in the early 20th century, most commonly as a 12-bar phrase using the chords of the first, fourth, and fifth degrees of the major scale. Its origins as a primarily vocal form induced instrumental performers to imitate the human voice with “bent” notes. Lyric stanzas are usually in three lines, the words of the second generally repeating those of the first. The elaboration of the rural blues from Texas and the Mississippi delta established both lyric and instrumental traditions, often featuring speech-like inflection and guitar accompaniment. The bandleader W.C. Handy’s compositions brought blues elements to the popular music of the first decades of the century. The first blues recordings, in the early 1920s, featured singers such as Ma Rainey and Bessie Smith using jazz accompanists; their style would become known as classic blues. The highly personal interpretations and improvisation of the blues, combined with elements of its structure and inflection, served as the foundation for jazz, rhythm and blues, and rock music.

Bluestocking In mid- 18th-century England, any of a group of women who met to discuss literature. Attempting to replace the playing of cards and such social activities with more intellectual pursuits, they held “conversations” to which they invited men of letters and members of the aristocracy with literary interests. The term probably originated when Mrs. Elizabeth Vesey invited the learned Benjamin Stillingfleet to one of her

parties; he declined, saying he lacked appropriate dress, until she told him to come “in his blue stockings” — the ordinary worsted stockings he was wearing at the time. The word bluestocking came to be applied derisively to a woman who affects literary or learned interests.

Bluford Vblii-fordX, Guion S(tewart), Jr. (b. Nov. 22, 1942, Philadelphia, Pa., U.S.) U.S. astronaut. He flew 144 combat missions in the Vietnam War; on his return, he received a Ph.D. in aerospace engineering from the Air Force Institute of Technology. He joined NASA’s astronaut program in 1978 and flew on numerous space-shuttle missions; his first was Challenger' s third flight (1983), the first to be launched and land at night. He was the first African American to fly in space.

Blum VbliimX, Leon (b. April 9, 1872, Paris, France — d. March 30, 1950, Jouy-en-Josas) French politician and writer. He made a name as a brilliant literary and drama critic, then entered politics in the French Socialist Party. As a member of the Chamber of Deputies (1919-28, 1929-40), he became a leader of the Socialists from 1921. The chief architect of an electoral alliance of the left, he became the first Socialist (and the first Jewish) premier of France as head of the Popular Front government (1936-37). He introduced such reforms as the 40-hour workweek and collective bargaining and nationalized the chief war industries and the Bank of France. Arrested by the Vichy government in 1940, he was imprisoned until 1945. In the postwar years he was one of France’s leading veteran statesmen.

Blumberg Vbbm-borgX, Baruch S(amuel) (b. July 28, 1925, New York, N.Y., U.S.) U.S. research physician. He received his M.D. from Columbia University. His discovery of an antigen that he later proved to be part of the hepatitis B virus, and which causes the body to produce antibodies to the virus, led to blood-donor screening and a vaccine. He shared a 1976 Nobel Prize in Physiology or Medicine with D. Carleton Gajdusek.

Blunt, Anthony (Frederick) (b. Sept. 26, 1907, Bournemouth, Hampshire, Eng.— d. March 26, 1983, London) British art historian and spy. He began his espionage for the Soviet Union after meeting Guy Burgess at the University of Cambridge in the 1930s. From 1937 Blunt had a brilliant career as an art historian, publishing scores of scholarly works that largely established art history in Britain. In World War II he served in British military intelligence and also gave secret information to the Soviets. In 1945 he was appointed surveyor of the king’s (later queen’s) pictures, and in 1947 he became director of the prestigious Courtauld Institute. He ceased active intelligence work but in 1951 arranged for the escape of Burgess and Donald Maclean (1913-1983) from Britain. In 1964, after the defection of Kim Philby, Blunt was confronted by British authorities and secretly confessed his Soviet connections. When his past as the “fourth man” in the spy ring was made public in 1979, he was stripped of the knighthood awarded him in 1956.

Bly, Nellie orig. Elizabeth Cochrane (b. May 5, 1867?, Cochran’s Mills, Pa., U.S. — d. Jan. 27, 1922, New York, N.Y.) U.S. newspaper writer. Bly started writing for The Pittsburgh Dispatch at age 18, producing feature articles on such subjects as divorce and slum life. After joining the New York World, she feigned insanity to get into an asylum and wrote an expose that brought about needed reforms. Beginning in

1889, in an attempt to beat the fictional record in Jules Verne's Around the World in Eighty Days, she circled the globe in about 72 days, 6 hours. The much-publicized trip made her byname a celebrated synonym for a female star reporter.

Bly, Robert (Elwood) (b. Dec. 23, 1926, Madison, Minn., U.S.) U.S. poet and translator. Bly attended Harvard University and the University of Iowa. In 1958 he founded the magazine The Fifties (later The Sixties), which published the works of young poets. He helped found American Writers Against the Vietnam War, and he donated his 1968 National Book Award prize money (received for The Light Around the Body) to a draft resisters' organization. His best-selling Iron John (1990) probed the male psyche, and Bly became the best-known leader of the "men's movement." In 2001 he published The Night Abraham Called to the Stars, poems utilizing the Arabic ghazal form. He is also known for his translations of a wide range of poetry.

Blyton Vbll-t 3 n\, Enid (Mary) (b. Aug. 11, 1897, London, Eng. — d. Nov. 28, 1968, London) English children's writer. Trained as a schoolteacher, she published her first book, Child Whispers, in 1922. She went on to produce more than 600 children's books and numerous magazine articles. She is probably best known for several book series, including those featuring Noddy, the Famous Five, and the Secret Seven. Though

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often criticized for their stereotyped characters, simple writing style, and didactic moralism, her books were widely translated and remained internationally popular long after her death.

BMW in full Bayerische Motoren Werke Vbl-er-ish-o-mo-'tor-on-'ver-koV AG German automaker. Founded as an aircraft engine manufacturer in 1916, the company assumed the name Bayerische Motoren Werke and became known for its high-speed motorcycles in the 1920s. During World War II, BMW built the world's first jet airplane engines for the Luftwaffe. It suffered financially in the postwar period but recovered after 1959 with a new line of conventionally designed high-performance cars. The company's turnaround was also credited to German entrepreneur Herbert Quandt, who purchased a controlling share of BMW's stock in 1959. In the 21st century the firm's brands included BMW cars and motorcycles, MINI automobiles, and Rolls-Royce. Members of the Quandt family continued to hold a significant stake in the company.

B'nai B'rith Vbo-'na-'brithN (Hebrew: "Sons of the Covenant") Oldest and largest Jewish service organization. Founded in New York City in 1843, it now has men's lodges, women's chapters, and youth organizations around the world. Its goals include defending human rights, aiding Jewish college students (mainly through the Hillel Foundation), sponsoring educational programs for adult and youth groups, helping victims of

natural disasters, supporting hospitals and philanthropic institutions, and promoting the welfare of Israel. In 1913 it established the Anti-Defamation League to combat anti-Semitism.

Bo Hai Vbo-'hrf or Po Hai conventional Gulf of Chihli Vjo-'leX Arm of the Yellow Sea off the northern China coast. With the Gulf of Liaodong (generally considered part of the Bo Hai), its maximum dimensions are 300 mi (480 km) northeast- southwest and 190 mi (306 km) east- west. The Liao River and Huang He (Yellow River) empty into it.

Bo Juyi Vbwo-'jue-'eX or Po Chu-i (b. 772, Xinzheng, China — d. 846, Luoyang) Chinese poet of the Tang dynasty. He began composing poetry at age 5, and at age 28 he passed the examinations for the Chinese civil service. He rose steadily in official life and became the informal leader of a group of poets who rejected the courtly style of the time, believing that poetry should have a moral and social purpose. His satirical ballads and poems of social protest often took the form of free verse based on old folk ballads. He was revered in both China and Japan, where his poems, notably the “Song of Everlasting Sorrow,” became material for other literary works.

bo tree See bodhi tree

boa Any of about 60 species of stout-bodied snakes (subfamily Boinae, family Boidae) found in both the Old and New Worlds, mostly in warm regions. Species vary in length from about 8 in. (20 cm) to more than 25 ft (7.5 m). Most are terrestrial or semiaquatic; some live in trees. Most species have blotches and diamonds on their brown, green, or yellowish body. Boas bite their prey, then kill by wrapping their body around the prey and crushing it. Several species have heat-sensitive lip pits for detecting warm-blooded prey, and most bear live young. Contrary to folklore, boas are not dangerous to humans.

Boadicea See Boudicca

boar or wild boar or wild pig Any wild member of the pig species Sus scrofa; the ancestor of domestic pigs. It is native to forests ranging from western and northern Europe and North Africa to India, the Andaman Islands, and China and has been introduced to New Zealand and the U.S. It has a bristly, blackish or brown coat and stands up to 35 in. (90 cm) tall at the shoulder. Except for old, solitary males, boars live in groups. They are omnivores and are good swimmers. They have sharp tusks and, though normally not aggressive, can be dangerous. Because of its strength, speed, and ferocity, the boar has long been a prized game animal.

Board of Trade See Board of Trade

Boas Vbo-,az\, Franz (b. July 9, 1858, Minden, Westphalia [Germany] — d. Dec. 22, 1942, New York, N.Y., U.S.) German-bom U.S. anthropologist. Trained in physics and geography (Ph.D., 1881), Boas was part of an early scientific expedition to Baffin Island (1883-84), where he turned to studying Eskimo culture. He later studied native peoples of British Columbia, including the Kwakiutl. From 1896 to 1905 he directed the Jesup North Pacific Expedition, which investigated the relationships between the aboriginal peoples of Siberia and North America. Teaching

at Columbia University from 1896

until his death, he was a leading organizer of the profession in the U.S. and the mentor of Ruth Benedict, Alfred L. Kroeber, Margaret Mead, and Edward Sapir. He is largely credited with establishing anthropology as an academic discipline in the U.S. His achievements in anthropology are virtually unrivaled.

Before Boas, most anthropologists adhered to a relatively crude theory of sociocultural evolution, arguing that some peoples are inherently more civilized or developed than others. Boas argued that such views are ethnocentric and that all human groups have actually evolved equally but in different ways. It is largely because of Boas that anthropologists now attribute human differences to historic “cultural,” rather than genetic, factors. His books include The Mind of Primitive Man (1911), Primitive Art (1927), and Race, Language, and Culture (1940).

boat people Refugees fleeing by boat. The term originally referred to the thousands of Vietnamese who fled their country by sea following the collapse of the South Vietnamese government in 1975. Crowded into small vessels, they were prey to pirates, and many suffered dehydration, starvation, and death by drowning. The term was later applied to waves of refugees who attempted to reach the U.S. by boat from Cuba and Haiti and also to Afghan and other refugees seeking asylum in Australia.

Bob and Ray in full Robert Brackett Elliott and Raymond Walter Goulding (respectively b. March 26, 1923, Boston, Mass., U.S.(b. March 20, 1922, Lowell, Mass.) — d. March 24, 1990, Manhasset, N.Y.) U.S. comedy team. They met while working at a Boston radio station and soon established their comic style in a program of parodies and satire (1946-51). The Bob and Ray Show was nationally syndicated (1951-53), and their comedy sketches were popular in the 1950s and ’60s on several networks. They also performed in the theatre and starred in the Broadway show The Two and Only (1970).

bobbin Elongated spool of thread, used in the textile industry. In modem processes, the spun fibres are wound on bobbins; the weft filling in weaving comes off bobbins. Bobbins are essential to the manufacture of bobbin lace (see lacemaking). The first bobbin lace probably originated in Flanders in the early 16th century. Early bobbin lace consisted of rows of deep acute-angled points worked from a narrow band, and the patterns were usually similar to those of the needle laces. It was much used for ruffs and collars in the 1 6th— 1 7 th centuries. See also tapestry.

bobcat Bobtailed, long-legged North American cat (Lynx rufus) found in forests and deserts from southern Canada to southern Mexico. It is a close relative of the lynx and caracal. Bobcats have large paws and tufted ears; are 24-40 in. (60-100 cm) long, excluding the 4-8-in. (10-20-cm) tail; stand 20-24 in. (50-60 cm) at the shoulder; and weigh 15-33 lb (7—15 kg). The fur is pale brown to reddish with black spots. Bobcats are nocturnal and generally solitary. They feed on small mammals and some birds

and are important for controlling rodent and rabbit populations. They are sometimes found in suburban areas. See photograph on opposite page.

bobolink Vbab-3-,lii]k\ Songbird (Dolichonyx oryzivorus) that breeds in northern North America and winters chiefly in central South America. Migrating flocks may raid rice fields, and the fat “ricebirds” were formerly shot as a table delicacy. In the breeding season the 7-in (18-cm) male bobolink (named for his bubbling song) has a black underside, yellow hindneck, white back and rump, and white patches on the wings; in winter he resembles the brown female.

bobsledding Sport of sliding down a winding ice-covered run on a large metal sled (bobsled). The sled is equipped with two pairs of runners, a long seat for two or more (usually four) people, a steering wheel or steering ropes, and a hand brake. Bobsledding originated in Switzerland in the 1 890s and was included in the first Olympic Winter Games in 1924. Championship competitions are held each year. Bob runs are typically about 4,920 ft (1,500 m) long, with 15-20 banked turns. Four-person sleds attain speeds approaching 100 mph (160 kph).

Boas, 1 941

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bobwhite North American quail species (Colinus virginianus) that exists in about 20 subspecies from southern Canada to Guatemala. It is reddish brown and has a gray tail. Its name is suggestive of its two-note call. A popular game bird of the southern and central U.S., it is found in brush, open pinelands, and abandoned fields.

Boccaccio \bok-'kach-cho\, Giovanni (b. 1313, Paris, France — d. Dec. 21, 1375, Certaldo, Tuscany)

Italian poet and scholar. His life was full of difficulties and occasional bouts of poverty. His early works include The Love Afflicted (c. 1336), a prose work in five books, and The Book of Theseus (c. 1340), an ambitious epic of 12 cantos. He is best known for his Decameron, a masterpiece of classical Italian prose that had an enormous influence on literature throughout Europe. A group of 100 earthy tales united by a frame story, it was probably composed 1348-53. After this period he turned

to humanist scholarship in Latin.

With Petrarch, he laid the foundations for Renaissance humanism, and through his writings in Italian he helped raise vernacular literature to the level of the classics of antiquity.

Boccherini \,ba-k3-'re-ne\, Luigi (Rodolfo) (b. Feb. 19, 1743, Lucca — d. May 28, 1805, Madrid, Spain) Italian composer. Son of a musician, he received excellent early training and toured widely in Europe as a cellist. He held positions at the courts of Madrid and Prussia. His vast chamber music output includes some 125 string quintets (more than any other composer), some 90 string quartets, and many string trios. He also wrote symphonies and cello concertos. The elegance and charm of his music has ensured its continuing popularity.

boccie or bocci or bocce \'ba-che\ (from Italian bocce, “balls”) Game of Italian origin, similar to bowls. It is played on a long, narrow, packed-clay court enclosed with boarded ends and sides. Each player or team in turn rolls four balls (made of wood, metal, or composition material) toward a smaller target ball. The object is to bring the ball to rest nearest the target ball (for which points are awarded at the end of a round), to protect a well-placed ball, or to knock aside an opponent’s ball. The game usually proceeds until one side has 12 points.

Boccioni Xbot-'cho-neV Umberto (b. Oct. 19, 1882, Reggio di Calabria, Italy — d. Aug. 16, 1916, Verona) Italian painter, sculptor, and theorist. He was trained in the studio of Giacomo Balia (1871-1958) in Rome. The most energetic member of the Futurist group (see also Futurism), Boccioni helped publish Technical Manifesto of the Futurist Painters (1910), promoting the representation of modem technology, power, time, motion, and speed. These ideas are best shown in his masterpiece of early modem sculpture, Unique Forms of Continuity in Space (1913). His painting The City Rises (1910) is a dynamic composition of swirling human figures in a fragmented crowd scene.

Bobcat (Felis rufa)

JOE VAN WORMER/PHOTO RESEARCHERS

Bochco \'bach-ko\, Steven (Ronald) (b. Dec. 16, 1943, New York, N.Y., U.S.) U.S. television writer, director, and producer. He worked as a scriptwriter and producer for Universal Studios (1966-78) and MTM Enterprises (1978-85) before forming his own production company in 1987. He cowrote and produced such successful television dramas as Hill Street Blues (1981-86), L.A. Law (1986-94), and NYPD Blue (from 1993), winning numerous Emmy Awards for his scripts.

B6cklin\'bcek-len\, Arnold (b. Oct. 16, 1827, Basel, Switz. — d. Jan. 16, 1901, Fiesole, Italy) Swiss-bom Italian painter. After studies and work in northern Europe and Paris, he won the patronage of the king of Bavaria with his mural Pan in the Bulrushes (1856-58). From 1858 to 1861 he taught at the Weimar Art School and executed mythological frescoes for the Public Art Collection in his native Basel. He settled in Italy, painting nymphs, satyrs, tritons, moody landscapes, and sinister allegories that presaged Symbolism and Surrealism.

His later style was sombre, mystical, and morbid, as in his five versions of The Isle of the Dead (1880-86).

Though most of his time was spent in Italy, he was the most influential artist in the German- speaking world in the late 19th century.

Bodawpaya \ 1 b6-d6-'pI-9\ (b.

1740/41— d. 1819, Amarapura,

Myanmar) King of Myanmar (Burma) (r. 1782-1819). He was a son of Alaungpaya and the sixth monarch of the Alaungpaya dynasty. Bodawpaya deposed his grandnephew to become king. In 1784 he invaded the kingdom of Arakan and deported more than 20,000 of its people as slaves; in 1785 he attempted to conquer Siam. His oppressive rule in Arakan led to rebellion; his pursuit of rebel leaders across the border into British-controlled Bengal nearly brought him into open conflict with the British. His campaigns in Assam heightened tensions. A fervent Buddhist, he proclaimed himself Arimittya, the messianic Buddha destined to conquer the world.

Bodensee See Lake Constance

Bode's law Rule giving the approximate distances of planets from the Sun. First announced in 1766 by the German Johann Daniel Titius (b. 1729 — d. 1796), it was popularized, from 1772, by his countryman Johann Elert Bode (b. 1747 — d. 1826). It may be given as follows: To each number in the sequence 0, 3, 6, 12, 24, and so on, add 4 and divide the result by 10. The answers closely approximate the distances from the Sun, in astronomical units, of the first seven planets. Bode’s law also suggested that a planet should be found between Mars and Jupiter, where the asteroid belt was later discovered. Once thought to have some significance regarding the formation of the solar system, it is now regarded as a numerological curiosity.

bodhi Vbo-de\ (Sanskrit and Pali: “awakening” or “enlightenment”) In Buddhism, the final enlightenment that ends the cycle of death and rebirth and leads to nirvana. This awakening transformed Siddhartha Gautama into the historical Buddha. Bodhi is achieved by ridding oneself of false

beliefs and the hindrance of passions through the discipline of the Eightfold Path. Though not supported in canonical texts, commentaries give a threefold classification of bodhi: that of a perfectly enlightened one, or a Buddha; that of an independently enlightened one; and that of an arhat.

bodhi tree or bo tree In Buddhism, the fig tree under which the Buddha sat when he attained enlightenment (bodhi) at Bodh Gaya (near Gaya,

Boccaccio, detail of a fresco by Andrea del Castagno; in the Cenacolo di Sant'Apollonia, Florence.

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"Self-Portrait with Death as a Fiddler," oil on canvas by Arnold Bocklin, 1 872; in the Nationalgalerie, Berlin.

COURTESY OF THE STAATLICHE MUSEEN PREUSSISCHER KULTURBESITZ, NATIONALGALERIE, BERLIN; PHOTOGRAPH, WALTER STEINKOPF

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India). The tree growing on the site now is believed to be a descendant of the original, planted from a cutting of a tree in Sri Lanka that had been propagated from the original; both trees are sites of pilgrimage for Buddhists. The bo tree or a representation of its leaf has often been used as a symbol of the Buddha.

Bodhidharma \ 1 bo-di- , dor-m9\ Chinese Damo Japanese Daruma (fl. 6th century ad) Legendary Indian monk credited with the establishment of the Chan (Son, or Zen) school of Buddhism. Considered the 28th Indian successor in a direct line from the Buddha Gautama, he is recognized by the Chan school as its first patriarch. Legend states that he traveled from India to Guang (now Guangzhou), China, where he was granted

an interview with the emperor Wudi, who was famous for his good works. He told the emperor that meditation, not good deeds, led to enlightenment. He himself was said to have meditated sitting motionless for nine years.

bodhisattva \ 1 bo-di-'s9t-v9\ Term for the historical Buddha Gautama prior to his enlightenment as well as for other individuals destined to become buddhas. In Mahayana Buddhism the bodhisattva postpones attainment of nirvana in order to alleviate the suffering of others. The ideal supplanted the Theravada Buddhist ideals of the arhat and the self-enlightened buddha, which Mahayana deemed selfish. The number of bodhisattvas is theoretically limitless, and the title has been applied to great scholars, teachers, and Buddhist kings. Celestial bodhisattvas (e.g., Avalokitesvara) are considered manifestations of the eternal Buddha and serve as savior figures and objects of personal devotion, especially in East Asia.

Bodin \b6-'da n \/ Jean (b. 1530, Angers, Fr. — d. June 1596, Laon) French political philosopher. He studied at the University of Toulouse and later taught law there (1551-61). In 1571 he entered the household of the king's brother, Francois, duke d'Alengon. He favoured negotiation with the Huguenots, with whom the government was engaged in a civil war, and opposed the sale of royal domains. His The Six Bookes of a Commonweale (1576) won him immediate fame. In it he suggested that the key to securing order and authority lay in recognition of the state's sovereignty, which he believed derived from divine right and not from the consent of the subject. He distinguished three types of government: monarchy (which he favoured), aristocracy, and democracy.

Bodleian \bod-Te-on\ Library Library of the University of Oxford and one of the oldest and most important nonlending reference libraries in Britain. The Bodleian is particularly rich in Asian manuscripts and collections of English literature, local history, and early printing. Though it was established earlier, it was not secured by the university until 1410. After a period of decline, it was restored by Sir Thomas Bodley (1545—1613), a collector of medieval manuscripts, and reopened in 1602. Under provisions established in 1610 and 1662, it is a legal deposit library entitled to free copies of all books printed in Britain.

Bodmer Vbod-morV Johann Georg (b. Dec. 6, 1786, Zurich, Switz. — d. May 30, 1864, Zurich) Swiss inventor of machine tools and textile-making machinery. In 1824 he established a small factory in England to make textile machinery, and by 1833 he had a shop equipped with his own machine tools. Between 1839 and 1841 he patented more than 40 specialized machine tools that he then set up in an ingenious factory-type arrangement. A gear-making machine that cut teeth of predetermined pitch, form, and depth in a metal blank was especially noteworthy. Bodmer also patented various steam-engine devices and is credited with inventing the cylinder with opposed pistons.

Bodoni \bo-'do-ne\, Giambattista (b. Feb. 16, 1740, Saluzzo, Piedmont — d. Nov. 29, 1813, Parma, French Empire) Italian typographer. Son of a printer, he served an apprenticeship at the press of the Roman Catholic Church in Rome. In 1768 he assumed management of the Royal Press of the duke of Parma. By the 1780s he was designing his own typefaces; the Bodoni typeface appeared in 1790 and is still in use today. He became internationally known and collectors sought his books. His many important works include fine editions of Horace (1791), Virgil (1793), and

Homer’s Iliad (1808).

Bodrum See Halicarnassus
body louse See human louse

body modification and mutilation Intentional modification of the human body for religious, aesthetic, or social reasons. It is frequently performed for magical or pseudo-medical purposes, but cosmetic motives are equally common. The variability of the results in different cultures reflects varying ideals of beauty or morality. Modifications include head flattening, insertion of a lip plug, tattoos, scarification, and piercing of the ear and other parts of the body. Mutilations include male and female circumcision, foot binding, and amputation.

bodybuilding Developing of the physique through exercise and diet, often for competitive exhibition. Bodybuilding aims at displaying pronounced muscle tone and exaggerated muscle mass and definition for overall aesthetic effect. Weight training is the principal form of exercise used; high-protein foods and vitamin and mineral supplements contribute to the diet. Bodybuilding competition grew largely out of 19th-century European strongman theatrical and circus acts. The first important international competition was the Mr. Universe contest, founded in 1947. It was followed in 1965 by the even more prestigious Mr. Olympia contest. Competition for women began in the 1970s. In 1998 bodybuilding was granted provisional status by the International Olympic Committee. The use of steroids to enhance performance, though generally forbidden, has long been common among bodybuilders.

Boehm Vb6em\, Theobald (b. April 9, 1794, Munich, Bavaria — d. Nov. 25, 1881, Munich, German Empire) German flutist and flute designer. Son of a goldsmith, he was a self-taught virtuoso flutist. Realizing that the craft he learned from his father could be put to use to improve the instrument, he created a new kind of key mechanism in 1832. He later studied acoustics, and by 1 847 he had completely redesigned the flute, giving it a different internal shape, moving the holes, and extending the use of the keys. His work achieved a stronger and more uniform tone than that of earlier instruments and formed the basis for the modem flute.

Boeing Co. Major U.S. firm that is the world’s largest aerospace company and foremost maker of commercial jet transports. It was founded by William E. Boeing (1881-1956) in 1916 (as Aero Products Company). In the late 1920s it became part of United Aircraft and Transport Corp., but it reemerged as an independent entity in 1934 when that company was broken up to comply with antitrust legislation. Boeing pioneered the development of single- wing planes in the 1930s; its B-l 7 Flying Fortress (first flown 1935) and B-29 Superfortress (1942) played prominent roles in World War II. After the war the company developed the B-52 jet bomber, long a mainstay of U.S. strategic forces. It produced the first U.S. jetliner, the Boeing 707 (in service 1958), and went on to develop a highly successful series of commercial jet transports. By the start of the 21st century these formed seven families — the narrow-body 737 and 757; wide-body 747, 767, and 777; 717 (formerly McDonnell Douglas MD-95); and MD-1 1. In the 1960s Boeing built the Lunar Orbiters, Lunar Roving Vehicles, and the first stage of the Saturn V rockets (see Saturn) for the U.S. Apollo program. Beginning in 1993, it served as NASA’s prime contractor for the International Space Station. In 1996 it purchased

the aerospace and defense units of Rockwell International Corp., and a year later it bought McDonnell Douglas Corp. It acquired the satellite business of Hughes Electronics in 2000. See also Lockheed Martin Corp.

Boeotia \be-'o-sh3\ District and ancient republic, eastern central Greece. Bounded by Attica and the Gulf of Corinth, its chief cities were Orchomenus and Thebes. Inhabited by Boeotians, an Aetolian people from Thessaly, it became politically significant after the Boeotian League was formed under Theban leadership c. 600-550 bc. Hostile to Athens, the League revolted against it c. 447 bc. In the Peloponnesian War, Boeotia defeated Athens at Delium in 424 bc. Led by Thebes, it dominated Greece until Thebes was destroyed by Alexander the Great c. 335 bc.

Boer See Afrikaner

Boerhaave Vbiir-.ha-voV Hermann (b. Dec. 31, 1668, Voorhout, Neth. — d. Sept. 23, 1738, Leiden) Dutch physician. As a professor at the University of Leiden, he was renowned as a teacher, and he is often credited with founding the modern system of teaching medical students at the patient’s bedside. His reputation as one of the greatest physicians of the 18th century lay partly in his attempts to organize the mass of medical information known at the time, in a series of major texts and encyclopedic works.

Boethius \bo-'e-the-3s\ in full Anicius Manlius Severinus Boethius (b. ad 470^-75?, Rome — d. 524, Pavia?) Roman scholar, Christian philosopher, and statesman. Born to a patrician family, he became consul in 510 and subsequently chief minister to the Ostrogothic king Theodoric.

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Accused of treason and condemned to death, he wrote his Neoplatonic The Consolation of Philosophy while in prison awaiting execution. The work was extremely popular and influential through the Middle Ages and later. He is also known for his translations of works of Greek logic and mathematics, including those of Porphyry and Aristotle. His translations and commentaries were among the basic texts of medieval Scholasticism.

bog body Any of an informal collection of some 700 variously preserved human remains found over the past 200 years in natural peat bogs, mostly in western Europe. The bodies, including the soft tissues and the stomach contents, remain preserved because of the anaerobic fluid conditions in the bogs. They range chronologically from c. 8000 bc to early medieval times. That they have been variously found with cut throats, severed limbs, ropes around the neck, and so on suggests the possibility of ritual killings, murders, and ignominious burial (since none was found within a proper grave).

bog iron ore Iron ore consisting of hydrated iron oxide minerals such as limonite and goethite formed by precipitation of groundwater flowing into wetlands. Bacterial action contributes to formation of the ore. Eco-

nomically useful deposits can regrow within 20 years after harvesting. Bog iron was widely used as a source of iron in the past.

Bogarde \ l bo-,gard\ / Sir Dirk orig. Derek Niven van den Bogaerde (b. March 28, 1921, London, Eng. — d. May 8, 1999, London) British actor. The son of a Dutch-bom art critic, he made his stage debut in 1939 and won a film contract from the Rank studios after World War II. After appearing for a decade mainly in light comedies such as Doctor in the House (1953), he began demonstrating his acting range in serious films such as The Doctor’s Dilemma (1958), The Servant (1963), Darling (1965), and Providence (1977).

Bogart, Humphrey (DeForest)

U.S. — d. Jan. 14, 1957, Hollywood, Calif.) U.S. actor. He had minor roles on the stage and in Hollywood before winning success on Broadway as the murderer Duke Mantee in The Petrified Forest (1935), a role he reprised in the film version (1936). He appeared in many low-budget films, usually as a gangster, before achieving stardom in High Sierra (1941) and The Maltese Falcon (1941). Often playing a sardonic loner who proves capable of love, he appeared in films such as Casablanca (1942), Treasure of the Sierra Madre (1948), and The African Queen (1951, Academy Award). He acted in four films with his fourth wife, Lauren Bacall.

(b. Dec. 25, 1899, New York, N.Y.,

Humphrey Bogart in Sahara (1943).

THE BETTMANN ARCHIVE

Bogazkoy \bo-'a-kcei\ or

Bogazkale \bo-'az-ka-le\ Village, north-central Turkey. Located about 90 mi (145 km) east of Ankara, it is on the ruins of the ancient Hittite capital of Hattusas (Hattusha). The site contains archaeological remains, including temples, city gates, and walls, associated with the powerful Hattie dynasty (c. 16th— 12th century bc) and was later described by Herodotus. Excavations conducted during the 20th century uncovered hundreds of cuneiform tablets attesting to the ancient city’s importance. Hattusas was designated a UNESCO World Heritage site in 1986.

Bogd Gegeen Khan Vbog-od-go-'genX (fl. 1911-24, Urga [Ulaanbaa-

tar]) “Living Buddha” of the Yellow Hat (Dge-lugs-pa) sect. In 1911 he proclaimed Mongolia independent of China, though true independence was not achieved until 1921. He remained head of state until 1924.

Bogomil \ 'ba-g9-.mil \ Any member of a religious sect that flourished in the Balkans during the 10th- 15th centuries. Founded by a 10th-century Bulgarian priest traditionally known as Bogomil, the sect’s beliefs arose from the possible fusion of dualistic doctrines imported mainly from the Paulicians (a sect of Armenia and Asia Minor) and a local Slavonic movement aimed at reforming the new Bulgarian Orthodox church. Its central teaching was that the visible, material world was created by the Devil. The Bogomils taught a Docetist Christology instead of the traditional doctrine of the Incarnation, rejected the Christian conception of matter as

a vehicle of grace, and repudiated the whole organization of the Orthodox church. They were active missionaries who lived rigorously ascetic lives. During the 1 1 th— 1 2th centuries Bogomilism spread over many European and Asian provinces of the Byzantine Empire; it also spread into western Europe, where it contributed to the formation of the Cathar heresy. In Bulgaria it remained a powerful force until the late 14th century. With the Ottoman conquest of southeastern Europe in the 15th century, its influence declined. See also dualism.

Bogota \,bo-go-'ta\ in full Capital District of Santafe de Bogota

City (pop., 1999: 6,276,428), capital of Colombia. It lies on a plateau east of the Andes Mountains. European settlement began in 1538 when Spanish conquistadores overran Bacata, the main seat of the Chibcha Indians; the name was soon corrupted to Bogota. It became the capital of the Viceroyalty of New Granada and a centre of Spanish colonial power in South America. It was the scene of revolt against Spanish rule (1810—1 1), and the revolutionary leader Simon Bolivar took the city in 1819. It became the capital of the confederation of Gran Colombia; when that entity was dissolved in 1 830, it remained the capital but of New Granada and later the Republic of Colombia. Today Bogota is an industrial, commercial, educational, and cultural centre.

Bogustawski \ l b6-gii- , slaf-ske\ / Wojciech (b. April 9, 1757, Glinna, Pol. — d. July 23, 1829, Warsaw) Polish actor, director, and playwright. He joined the Polish National Theatre in Warsaw as an actor in 1778 and later became its director (1783-1814). Considered the father of Polish theatre, he wrote over 80 plays, including numerous comedies adapted from western European writers as well as the popular original play Krakovians and Highlanders (1794). He helped develop theatre companies in Vilna (1785) and Lwow (1794) and toured with the Lwow company, performing in foreign and Polish plays. In 1787 he played Hamlet in his own translation of Shakespeare’s play.

Bohai See Parhae

Bohemia Former kingdom, central Europe. Settled in the 5th century ad by the Czechs, it became tributary to Charlemagne’s empire. It was part of the kingdom of Moravia in 870; on the dissolution of Moravia, it became a duchy with an important center at Prague. In the 10th century it expanded to include parts of Silesia, Slovakia, and Krakow. From the election of Ferdinand I as king in 1526, it remained under Habsburg rule

until 1918. Following World War I, Bohemia declared independence along with Moravia and Slovakia. It was invaded by Germany in 1939 on the pretext that much of the population was German. After World War II it became a province of Czechoslovakia (later the Czech Socialist Republic). On the breakup of the eastern European bloc, it became part of the independent Czech Republic in 1993.

Bohemian Forest German Bohmer Wald Vboe-mor-.valtV Mountain range, central Europe. It lies along the boundary between Bavaria (Germany) and Bohemia (Czech Republic), extending northwest-southeast from the Ohre River to the Danube River valley in Austria. Its highest point, the Arber, rises 4,780 ft (1,457 m). It is the source of the Vltava (Moldau) River.

Bohemian glass Decorative glass made in Bohemia from the 13th century. In the early 17th century,

Caspar Lehmann, gem cutter to Rudolf II in Prague, perfected the technique of gem engraving on glass.

By 1700, a heavy, high-lustre, richly ornamented potash-lime glass (Bohemian crystal) had become popular. In the late 18th century, black glass with chinoiserie designs was introduced. Ruby glass and an opaque glass with white overlay, both carved and enameled, were introduced in the 19th century.

Bohemian language See Czech

LANGUAGE

Bohemian glass goblet, relief cut and decorated with intaglio-engraved Baroque flowers, from the workshop of Friedrich Winter in Silesia, about 1 71 0-20; in the Museum of Decorative Arts, Prague

MUSEUM OF DECORATIVE ARTS, PRAGUE

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Bohemian school School of visual arts that flourished in and around Prague in the later 14th century.

Charles IV attracted artists and scholars to Prague from all over Europe.

French and Italian manuscripts inspired a local school of book illumination. Though most of the painters are anonymous, their achievements in panel painting and fresco had an important influence on German Gothic art. A vital Bohemian tradition in architecture provided the impetus for the great German Gothic architecture of the 15 th century.

Bohemond Vbo-o-mondV I orig.

Marc (b. 1050-58 — d. March 5 or 7, 1109, probably Bari) Prince of Otranto (1089-1109) and of Antioch (1098-1101, 1103-4). The son of a duke who held sway in southeastern Italy, he was nicknamed after a legendary giant. He joined his father's army and contested with Alexius I Comnenus for territory in the Byzantine Empire. In 1095 he joined the First Crusade, reconquering Byzantine lands from the Turks and capturing Antioch (1098). Rather than taking part in the battle to gain Jerusalem, Bohemond remained in Antioch, which he ruled as a principality. His efforts to muster French and Italian support against Alexius and the Byzantine Empire were ultimately unsuccessful.

B6hmVbcem\, Karl (b. Aug. 28, 1894, Graz, Austria — d. Aug. 14, 1981, Salzburg) Austrian conductor. Having risen from rehearsal pianist to chief conductor at the Graz Opera House, he was invited to conduct at the Munich Opera in 1921 . As director of the Dresden State Opera (1934-42), he conducted numerous premieres. He had a long association with the Salzburg Festival (from 1938) and was especially admired for his interpretations of the works of Wolfgang Amadeus Mozart. His recordings and performances elicited admirable qualities of warmth, subtlety, and lyricism.

Bohme Vbce-moV Jakob (b. 1575, Altseidenberg, Saxony — d. Nov. 21, 1624, Gorlitz) German philosophical mystic. Originally a cobbler, Bohme had a religious experience in 1600 that he felt gave him insight into how the tensions of his age could be resolved. He expounded this insight in his work Aurora (1612). The writings of Paracelsus inspired his interest in nature mysticism. In The Great Mystery (1623), he explained the Genesis account of creation in terms of Paracelsian principles. In On the Election of Grace, he expounded the free will problem, made acute at the time by the spread of Calvinism and its doctrine of predestination. He profoundly influenced later intellectual movements such as idealism and

Romanticism, and he is regarded as the father of theosophy.

Bohol \b6-'h6l\ Island (pop., 2000: 1,137,268), Philippines. Located in the Visayan group north of Mindanao, it has an area of 1,492 sq mi (3,864 sq km). Visited by the Spanish in 1565, it remained under their rule until the late 19th century. Its character is essentially rural and its economy agricultural. The chief settlements, including Loon and Talibon, are on the coast.

Bohr \'bor\, Niels (Henrik David) (b. Oct. 7, 1885, Copenhagen, Den. — d. Nov. 18, 1962, Copenhagen) Danish physicist. He studied the structure of the atom with J J. Thomson and Ernest Rutherford at the universities of Cambridge and Manchester. He was among the first to see the importance of an element's atomic number and postulated that any atom could exist only in a discrete set of states characterized by definite values of energy. He became the first to apply the quantum theory to atomic and molecular structure, and his concept of the atomic nucleus was a key step in understanding such processes as nuclear fission. From 1920 to 1962 he directed the newly created Institute for Theoretical Physics in Copenhagen. His work on atomic theory won him a Nobel Prize for Physics in 1922. He was president of the Royal Danish Academy from 1939 until his death. Though he contributed to atomic bomb research in the U.S. during World War II, he later dedicated himself to the cause of arms control. He received the first U.S. Atoms for Peace Award in 1957. Element

107, bohrium, is named in his honour. His son Aage Niels Bohr (b. 1922) shared the 1975 Nobel Prize for Physics with Ben Mottelson (b. 1926) and James Rainwater (1917-86) for their work on atomic nuclei.

Boieldieu \bo-yel-'dyce\, (Francois-) Adrien (b. Dec. 16, 1775, Rouen, France — d. Oct. 8, 1834, Jarsy) French composer. Well known as a concert pianist, he taught piano at the Paris Conservatoire from 1798. His early operas comiques won popularity in Paris, and he wrote several more operas as director of the French Opera in St. Petersburg (1804-10). Of his approximately 40 operas (including many one-act works), the most popular were Le Calife de Bagdad (1800), Le Petit Chaperon rouge (1818), and La Dame blanche (1825). He was France's leading opera composer of the early 19th century, but his achievements were increasingly overshadowed by those of Gioacchino Rossini.

Boigny, Felix Houphouet- See Felix Houphouet-Boigny

boil or furuncle Vfyur-.oq-kalX or furunculosis Inflamed pus-filled swelling due to staphylococcus skin infection at a hair follicle. It is painful and feels hard. Boils usually occur in hairy areas exposed to friction and maceration. Scratching an existing skin disorder may introduce staphylococci on the skin into hair follicles and cause a boil to arise. A carbuncle occurs when several adjoining boils merge. Healing requires discharging the pus. Treatment involves antibiotics.

Boileau \bwa-'lo\ (-Despreaux), Nicolas (b. Nov. 1, 1636, Paris, France — d. March 13, 1711, Paris) French poet and literary critic. His L'Art poetique (1674), a didactic treatise in verse setting out rules of composition of poetry in the classical tradition, provides valuable insight into the literary controversies of the period. He also translated the classical treatise On the Sublime, attributed to Longinus, which ironically became a key source of the aesthetics of Romanticism. His works upheld

classical standards in both French and English literature.

boiler Apparatus for converting a liquid to vapour. A boiler consists of a furnace in which fuel is burned, surfaces to transmit heat from the combustion products to the water (or other liquid), and a space where steam (or vapour) can form and collect. A conventional boiler burns a fossil fuel or waste fuel; a nuclear reactor may instead supply the heat. There are two types of conventional steam boiler. In a fire-tube boiler, the water surrounds the steel tubes through which hot gases from the furnace flow; easy to install and operate, fire-tube boilers are widely used to heat buildings and to provide power for factory processes, as well as in steam locomotives. In a water-tube boiler, the water is inside tubes, with the hot furnace gases circulating outside the tubes; water-tube boilers, which produce more and hotter steam, are used in ships and factories. The largest are found in the central-station power plants of public utilities; other large units are used in steel mills, paper mills, oil refineries, and chemical plants. See also steam engine.

boiling Cooking of food by immersion in water, stock, or other liquid heated to its boiling point. Boiling is used to cook meats, vegetables, and some grain foods (pasta, for example). Scalding, accomplished by heating to about 1 85 °F (85 °C), is commonly used to prepare milk to be used as an ingredient in various dishes. At just above the scalding temperature, fish and eggs may be poached. At the simmering point, just below that of boiling, soups, stews, and pot roasts may be prepared. Many foods, especially vegetables, are steamed in a rack placed above boiling water.

boiling point Temperature at which a liquid is converted to vapour when heated. At the boiling point, addition of heat results in the transformation of the liquid into its vapour without an increase in temperature. A liquid’s boiling point varies according to the liquid’s characteristics and the applied pressure. Water at standard atmospheric pressure, or sea level, boils at 212 °F (100 °C), while ethanol boils at about 172 °F (78 °C). At higher altitudes, boiling points are lower and foods can take longer to cook; pressure cookers can be used to increase the pressure so that the boiling point is raised.

Bois, W.E.B. Du See W.E.B. Du Bois

Boise \'boi-ze\ City (pop., 2000: 185,787), capital of Idaho, U.S. The largest city in the state, it lies on the Boise River. Following the 1862 gold rush to the river basin, Fort Boise was established in 1863, and a community developed to provide services for the mines. It became the capital of Idaho Territory in 1864, and of the state in 1890. Agricultural expansion and the growth of the lumber industry contributed to its rapid growth. Boise is the headquarters of the Boise National Forest.

Resurrection, panel painting by the Master of Wittingau, c. 1 380-90; in the National Gallery, Prague.

GIRAUDON/ART RESOURCE, NEW YORK

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Boito Vbo-e-toV Arrigo orig. Enrico Giuseppe Giovanni Boito

(b. Feb. 24, 1842, Padua, Lombardy- Venetia — d. June 10, 1918, Milan, Italy) Italian composer and librettist. As a composer, he is remembered for his opera Mefistofele (1868). He wrote the text for Giuseppe Verdi's Inno delle nazioni (1862) and revised the libretto for his Simon Boccanegra (1881), tasks that led to his writing the celebrated texts for Verdi's masterworks Otello (1887) and Falstaff { 1893). He was also the librettist of Amilcare Ponchielli's La Gioconda (1876). His own opera Nerone was left unfinished at his death.

Bojador V.bo-js-'dorV Cape Cape, West Africa. It extends into the Atlantic Ocean off Western Sahara south of the Canary Islands. After 1434 the Portuguese began exploiting the region, particularly for slaves. Later the area was disputed by Spain and Portugal; Spain finally gained control in 1860 and annexed it in 1884. After Spain's withdrawal from Western Sahara in 1976, Morocco claimed the cape, garrisoned troops there, and made the area a province.

BojanglesSee Bill Robinson

Bok, Edward (William) (b. Oct. 9, 1863, Den Helder, Neth. — d. Jan. 9, 1930, Lake Wales, Fla., U.S.)

Dutch-bom U.S. editor. Raised in a poor immigrant family in Brooklyn,

N.Y., Bok pursued a career in book and magazine publishing. As editor of the Ladies' Home Journal (1889—

1919) he devised departments to inform women on diverse subjects and led campaigns for public health and beautification. His decision to stop accepting patent-medicine advertising helped bring about the Pure Food and Drug Act (1906). He also broke the taboo against the printed mention of venereal disease.

His last years were devoted to working for civic improvement and world peace. He wrote a notable autobiography, The Americanization of Edward Bok (1920, Pulitzer Prize).

bok choy or Chinese mustard

Brassica chinensis, one of two types of Chinese cabbage. It has glossy dark green leaves and thick, crisp white stalks in a loose head. Its yellow-

flowering centre is especially prized. See also brassica; mustard family.

Bokassa \bo-'kas-3\, Jean-Bedel or Bokassa I (b. Feb. 22, 1921, Bobangui [Central African Republic] — d. Nov. 3, 1996, Bangui, Central African Republic) President of the Central African Republic (1966-77) and self-proclaimed emperor of the Central African Empire (1977-79). Son of a village chief, Bokassa joined the French army in 1939 and later received the Croix de Guerre for his service in Indochina. In 1961 he returned to head the army of the newly independent Central African Republic; five years later he overthrew the president, his cousin David Dacko. In 1977 he had himself crowned emperor. When he was found to have participated in the massacre of 100 schoolchildren and was accused of cannibalism, French paratroops removed him in a coup and reestab- lished the republic. Bokassa settled in Cote d'Ivoire. He was sentenced to death in absentia in 1980, but his death sentence was later commuted.

Bokhara See Bukhara

Bokn Fjord Vbiik^n-'fyordN Inlet of the North Sea, southwestern Nor- way. It is about 28 mi (45 km) long and 12 mi (20 km) wide. Its branches include other fjords, and it is dotted by many islands and islets. The major settlement along the fjord is Stavanger, a centre for offshore oil drilling.

Boleyn, Anne See Anne Boleyn

Bolingbroke Vba-liq-.briikV, Henry Saint John, 1 st Viscount (b.

Sept. 16, 1678, probably Wiltshire, Eng. — d. Dec. 12, 1751, Battersea, near London) British politician. After entering Parliament in 1701, he became a prominent Tory in the reign of Queen Anne, serving as secretary of war (1704-08) and of state (1710-15). He was dismissed from office by George I and, fearing impeachment because of his intrigues with the Jacobites, he fled to France in 1715. He returned to England in 1725 and became the centre of a literary circle that included Jonathan Swift, Alexander Pope, and

Edward Bok, photograph by Pirie Mac- Donald, 1 909.

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John Gay. He waged an influential propaganda campaign in opposition to the Whigs and their leader, Robert Walpole, and also wrote several historical and philosophical works, including The Idea of a Patriot King (published secretly by Pope in 1744 and as a corrected version in 1749).

Bolivar \bo-'le-var\, Simon known as The Liberator (b. July 24, 1783, Caracas, New Granada — d.

Dec. 17, 1830, near Santa Maria,

Colombia) South American soldier and statesman who led the revolu- tions against Spanish rule in New

Granada (now Colombia, Venezuela, and Ecuador), Peru, and Upper Peru (now Bolivia). The son of a Venezuelan aristocrat, Bolivar received a European education.

Influenced by European rationalism, he joined Venezuela's independence movement and became a prominent political and military leader. The revolutionaries expelled Venezuela' s Spanish governor (1810) and declared the nation's independence in 1811. The young republic was defeated by the Spanish in 1814, and Bolivar went into exile. In 1819 he undertook a daring attack on New Granada, leading some 2,500 men over routes considered impassable. Taking the Spanish by surprise, he defeated them quickly. With the help of Antonio Sucre, he secured the independence of Ecuador in 1822. He completed Jose de San Martin's revolutionary work in Peru, freeing that country in 1824. On Bolivar's orders, Sucre liberated Upper Peru (1825). As president of both Colombia (1821-30) and Peru (1823-29), Bolivar oversaw the creation in 1826 of a league of Hispanic American states, but the new states soon began warring among themselves. Less successful at ruling countries than at liberating them, Bolivar exiled himself and died on his way to Europe.

Simon Bolivar, detail of an engraving by C.G. Childs.

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Bolivar \bo-'le-var\ Peak or Pico Bolivar or La Columna Mountain, Venezuela. It is located in Sierra Nevada National Park. Rising 16,427 ft (5,007 m), it is the highest mountain in the Cordillera de Merida (a northeastern spur of the Andes Mountains) and in Venezuela.

Bolivia officially Republic of Bolivia Country, west-central South America. Area: 424,164 sq mi (1,098,581 sq km). Population (2005 est.): 8,858,000. Capitals: La Paz (administrative), Sucre (judicial). The population consists of three principal groups: Indians, largely Aymara and Quechua; mestizos; and descendants of Europeans. Languages: Spanish, Aymara, Quechua (all official). Religions: Christianity (predominantly Roman Catholic [official]; also Protestant); also vestiges of pre-Columbian religion. Currency: boliviano. Bolivia may be divided into three major regions. The southwestern highlands, or Altiplano, where Lake Titicaca is located, extends through southwestern Bolivia. It is enclosed by the second region, the western and eastern branches of the Andes Mountains. Much of the eastern branch is heavily forested terrain, with many deep river valleys; the western branch is a high plateau bordered by volcanoes, including the country's highest peak, Mount Sajama, which rises to 21,463 ft (6,542 m). The third region is a lowland area that comprises the northern and eastern two-thirds of the country; its rivers include the Guapore, Mamore, Beni, and upper Pilcomayo. Bolivia has a developing mixed economy based on the production of natural gas and agricul-

tural foodstuffs. It is a republic with two legislative houses; its head of state and government is the president. The Bolivian highlands were the location of the advanced Tiwanaku culture in the 7th– 1 1th centuries and, with its passing, became the home of the Aymara, an Indian group conquered by the Inca in the 15th century. The Inca were overrun by the invading Spanish conquistadorcs under Francisco Pizarro in the 1530s. By 1600 Spain had established the cities of Charcas (now Sucre), La Paz, Santa Cruz, and what would become Cochabamba and had begun to exploit the silver wealth of Potosf. Bolivia flourished in the 17th century, and for a time Potosf was the largest city in the Americas. By the end of the century, the mineral wealth had been depleted. Talk of independence began as early as 1809, but not until 1825 were Spanish forces finally defeated. Bolivia shrank in size when it lost Atacama province to Chile in 1884 at the end of the War of the Pacific and again when it lost most of Gran Chaco to Paraguay in 1938 as a result of the Chaco War. One of South

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America’s poorest countries, Bolivia was plagued by governmental instability for much of the 20th century. Social and economic tension continued in the early 21st century, fueled by resistance to government efforts to eradicate the growth of coca (from which the narcotic cocaine is derived), by unrest among Bolivia’s Indians, and by disagreements over how to exploit the country’s vast natural gas reserves.

Boll YbcelV Heinrich (Theodor) (b. Dec. 21, 1917, Cologne, Ger. — d. July 16, 1985, near Bonn, W.Ger.) German writer. As a soldier in World War II he fought on several fronts, a central experience in the development of his antiwar, nonconformist views. His ironic novels on the travails of German life during and after the war captured the changing psychology of the German nation. He became a leading voice of the German left. Among his works are Acquainted with the Night (1953), Billiards at Half-Past Nine (1959), The Clown (1963), Group Portrait with Lady (1971), and The Lost Honor ofKatharina Blum (1974). He won the Nobel Prize for Literature in 1972.

boll weevil Vbol-'we-voL Small beetle (Anthonomus grandis) found almost everywhere cotton is cultivated. It is the most serious cotton pest in North America. Adults vary in size according to how much food they received as larvae, but they average about 0.25 in. (6 mm) long, including the long, curved snout. In

the spring adults deposit eggs in cotton buds or fruit. After hatching, the larvae live within the cotton boll, destroying the seeds and surrounding fibres. Because the larvae and pupae remain inside the cotton bolls, they cannot be killed with insecticides.

The boll weevil destroys an estimated three to five million bales of cotton annually.

bollworm Vbol-.wormX Any larva of various moth species, including the pink bollworm (family Gelechiidae) and some Heliothis species (family Noctuidae; see corn earworm). Bollworms attack com, tomatoes, cotton, peas, alfalfa, beans, soybeans, flax, peanuts, and other commercial crops. They can be controlled by natural parasites, early crop planting, trap crops, and insecticides.

Bollywood Indian moviemaking industry that began in Bombay (now Mumbai) in the 1930s and developed into an enormous film empire. Bom-

Boll weevil (Anthonomus grandis)

HARRY ROGERS

bay Talkies, launched in 1934 by Himansu Rai, spearheaded the growth of Indian cinema. Throughout the years, several classic genres emerged from Bollywood: the historical epic, notably Mughal-e-azam (1960; “The Great Mughal”); the curry western, such as Sholay (1975; “The Embers”); the courtesan film, such as Pakeezah (1972; “Pure Heart”), which highlights stunning cinematography and sensual dance choreography; and the mythological movie, represented by Jai Santoshi Maa (1975; “Hail Santoshi Maa”). Star actors, rather than the films themselves, have accounted for most box-office success. Standard features of Bollywood films include formulaic story lines, expertly choreographed fight scenes, spectacular song-and-dance routines, emotion-charged melodrama, and larger-than-life heroes. At the beginning of the 21st century, Bollywood produced as many as 1,000 feature films annually, and international audiences began to develop among Asians in the U.K. and the U.S.

Bologna \bo-'lo-ny9\ City (pop., 2004 est.: 373,539), capital of Emilia-Romagna region, northern Italy. Located north of Florence, it lies at the northern foot of the Apennines. Originally the Etruscan town of Felsina, it became a Roman military colony c. 190 bc. It was subject to the Byzantine exarchate of Ravenna from the 6th century ad. It became a free commune in the 12th century. Incorporated into the Papal States in 1506, it was the scene of the crowning of Charles V in 1530. After a brief period of French occupation, it was restored to the Papal States in 1815, and in 1860 it was united to the Kingdom of Italy. The University of Bologna is among Europe’s oldest. The city is a road and rail centre for traffic between northern and southern Italy. It is the site of excellent medieval and Renaissance architecture and is famous for its cuisine. Locally, it was governed by leftists in the second half of the 20th century.

Bologna, Giovanni da See Giambologna

Bologna, University of Oldest university in Europe, founded in Bologna, Italy, in 1088. It became in the 12th– 13th centuries the principal centre for studies in civil and canon law, and it served as a model for the organization of universities throughout Europe. Its faculties of medicine and philosophy were formed c. 1200. The faculty of science was developed in the 17th century. In the 18th century women were admitted as students and teachers. The modem university includes faculties of law, political science, economics, letters and philosophy, natural sciences, agriculture, medicine, and engineering.

Bolognese school Ybo-lo-'nez, .bo-lo-'nyezN Works produced and theories expounded by the Academy of the Progressives, founded in Bologna c. 1582 by Lodovico, Agostino, and Annibale Carracci. In reaction against Mannerism, they advocated drawing directly from life. Among their leading students were Domenichino and Guido Reni. Their clear, simple pictures accorded well with the artistic demands of the Counter-Reformation, which wanted works of art to be immediately comprehensible. What began as a regional movement became one of the most influential forces in 17th-century art.

Bolshevik \ , bol-sho- l vik\ (Russian: “member of the majority”) Member of the wing of the Russian Social- Democratic Workers' Party led by Vladimir Ilich Lenin that seized control in the Russian Revolution of 1917. The group arose in 1903 when Lenin’s followers insisted that party membership be restricted to professional or full-time revolutionaries. Though they joined with their rivals, the Mensheviks (“members of the minority”), in the Russian Revolution of 1905, the two groups later split, and in 1912 Lenin formed his own party. Its appeal grew among urban workers and soldiers during World War I. The Bolshevik consolidation of power after 1917 became one prototype of totalitarianism; the other was fascism of Benito Mussolini and Adolf Hitler. See also Communist Party, Leninism.

Bolshoi Theatre complex in Moscow where concerts, opera, ballet, and dramatic works are presented. The institution (whose name means “Large”) dates back to 1776, when Catherine II licensed a company to give all theatrical performances in Moscow; its scope soon expanded to include opera and dance as well as drama. The original complex was built in 1825; it was rebuilt after a fire in 1853. The performing companies have changed over time, but the institution and the rebuilt edifice have survived.

Bolshoi Ballet \bol-'sh6i\ Leading ballet company of Russia, noted for elaborate productions of 19th-century classical ballets. The company was formed in 1776 and took the name of its home, Moscow’s Bolshoi Theatre, in 1825. Its influential choreographers included Marius Petipa, Carlo Blasis, and Aleksandr Gorsky. Yuri Grigorovich was artistic director from 1964 to 1995. Its many successful tours have introduced its outstanding

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dancers, including Yekaterina Geltzer, Vasily Tikhomirov, Galina Ulanova, and Maya Plisetskaya, to audiences worldwide.

bolt Mechanical fastener, usually used with a nut, for connecting two or more parts. Bolted joints can be readily disassembled and reassembled; hence bolts or screw fasteners are used more than other types of mechanical fastener. A bolt consists of a head and a cylindrical body with screw threads along a portion of its length. Nuts have internal (or female) threads to match those of the bolt. Washers are often used to prevent loosening and crushing.

bolt action Type of breech mechanism that was key to developing an effective repeating rifle. It combines the firing pin, a spring, and an extractor, all housed in or attached to the bolt. A projecting handle with a round knob moves the bolt back and forth. As the bolt is thrust forward, it pushes a cartridge into the chamber and cocks the piece. The trigger releases the spring-driven firing pin inside the bolt. After firing, the extractor on the head of the bolt removes the spent cartridge and ejects it. The bolt then moves a new cartridge from the magazine.

Bolton, Guy (Reginald) (b. Nov. 23, 1884, Broxboume, Hertfordshire, Eng. — d. Sept. 5, 1979, London) British-born U.S. playwright and librettist. The son of American parents, Bolton studied architecture before he began writing plays. His first play appeared on Broadway in 1911, but it was not until he began contributing to Broadway musicals that his fame spread. In collaboration with P.G. Wodefiouse and others, he wrote dozens of scripts scored by composers such as Jerome Kern (Oh, Boy!, 1917), George Gershwin (Lady, Be Good!, 1924; Girl Crazy, 1930), and Cole Porter (Anything Goes, 1934).

Boltzmann \'bolts- I man\, Ludwig (Eduard) (b. Feb. 20, 1844, Vienna, Austria — d. Sept. 5, 1906, Duino, Italy) Austrian physicist. He obtained his doctorate from the University of Vienna and thereafter taught at several German and Austrian universities. He was one of the first European scientists to recognize the importance of James Clerk Maxwell’s electromagnetic theory. He explained the second law of thermodynamics by applying the laws of mechanics and the theory of probability to the motions of atoms, and he is remembered as the developer of statistical mechanics. His work was widely attacked and misunderstood; subject to depression after 1900, he eventually committed suicide. Shortly after his death, his conclusions were finally supported by discoveries in atomic physics and by recognition that phenomena such as Brownian motion could be explained only by statistical mechanics.

Boltzmann constant Ratio of the universal gas constant (see gas laws) to Avogadro's number. It has a value of 1.380662 x 10 -23 joules per kelvin. Named after Ludwig Boltzmann, it is a fundamental constant of physics, occurring in nearly every statistical formulation of both classical and quantum physics.

bomb In volcanology, any unconsolidated volcanic material that has a diameter greater than 1.25 in. (32 mm). Bombs form from clots of wholly or partly liquid lava ejected during a volcanic explosion; they solidify and become rounded during flight. The final shape is determined by the initial size, viscosity, and flight velocity of the magma.

Bombay See Mumbai

bomber Military aircraft designed to drop bombs on surface targets.

Aerial bombardment can be traced to the Italo-Turkish War (1911), in which an Italian pilot dropped grenades on two Turkish targets. In World War I Zeppelins and large two- to four-engined biplanes were used as strategic bombers. In the 1930s small dive bombers were developed; they caused great destruction and panic in the Spanish Civil War and early in World War II. The latter conflict saw further development of heavy strategic bombers, which were used to destroy targets in the enemy's home territory; meanwhile, smaller fighter-bombers supported ground troops on the battlefield. After the war, jet-propelled long-range bombers carrying nuclear bombs were important to Cold War strategy, and they also dropped conventional bombs during the Vietnam War, the Persian Gulf War, and the Afghan conflicts. Efforts to evade increasingly sophisticated electronic early-warning systems have culminated in the development of U.S. stealth bombers, but cheaper and smaller jet fighter-bombers, equipped with electronic sensors and guided "smart" bombs, have proved effective in conflicts ranging from the Balkans to the Middle East.

Bombon, Lake See Lake Taal

Bomu River \'bo-mu\ River, central Africa. Flowing west, it forms the boundary between northern Congo and southern Central African Repub-

lic (where it is called the Mbomou). It flows in a wide 500-mi (800-km) curve through savannas to join the Uele River and form the Ubangi.

Bon Vpce n \ Indigenous religion of Tibet. It was originally concerned with magical propitiation of demonic forces, and its practices included blood sacrifices. It later developed a cult of divine kingship (with kings regarded as manifestations of the sky divinity), reformulated in Tibetan Buddhism as the reincarnation of LAMAS. Bon's order of oracular priests had their counterpart in Buddhist soothsayers, and its gods of air, earth, and underworld in the lesser Tibetan Buddhist deities. Though its religious supremacy ended in the 8th century, Bon survives in many aspects of Tibetan Buddhism and as a living religion on Tibet's northern and eastern frontiers.

Bon \'bon\ Popular annual festival in Japan, usually observed July 13-15, in honor of the spirits of deceased family members and of all the dead. As at the New Year festival, the dead are believed to return to their birthplaces. Memorial stones are cleaned, dances performed, and paper lanterns and fires are lit to welcome the dead and to bid them farewell when their visit ends.

Bon, Gustave Le See Gustave Le Bon

Bon Marche \bo n -mar-'sha\ French "Good Buy" Paris department store. It was founded as a small shop in the early 19th century, and by c. 1865 it had become the world's first true department store. Its 1876 building was designed by Alexandre-Gustave Eiffel (1832-1923). It is unrelated to the Bon Marche chain of department stores in the northwestern U.S.

Bona Dea \,bo-n3-'da-3\ In Roman religion, the deity of fruitfulness, both in the earth and in women. The dedication day of her temple on the Aventine was May 1. Her temple was cared for and attended only by women, though inscriptions show that there was a public side to her worship in which men could participate.

Bonaparte, (Marie-Annonciade-) Caroline (b. March 25, 1782,

Ajaccio, Corsica — d. May 18, 1839, Florence) Queen of Naples (1808—15). The youngest sister of Napoleon, she married Joachim Murat in 1800. Her ambitious nature was partially responsible for her husband's becoming king of Naples, among other achievements. Her relations with Napoleon became strained as she associated herself with Murat's shifting allegiances in 1814-15, which led to his execution. Caroline then took refuge in Trieste and became countess de Lipona.

Bonaparte, Jerome (b. Nov. 15, 1784, Ajaccio, Corsica — d. June 24, 1860, Villegenis, France) French nobleman. He was the youngest brother of Napoleon, from whom he became estranged after marrying a U.S. resident (1803) without Napoleon's consent; he later allowed his marriage to be annulled. Napoleon then married Jerome to Princess Catherine of Wurttemberg and made him king of Westphalia (1807-13). He served in the Russian campaign of 1812 and at the Battle of Waterloo. After Napoleon's fall, he lived in Florence; after the rise of his nephew, Napoleon III, he returned to France to become a marshal of France and president of the Senate.

Bonaparte, Joseph (b. Jan. 7, 1768, Corte, Corsica — d. July 28, 1844, Florence, Tuscany, Italy) French lawyer, diplomat, and soldier. Elder brother of Napoleon, he served during Napoleon's reign as king of Naples (1806-08), where he abolished feudalism, reformed the monastic orders, and reorganized the judicial, financial, and educational systems. He was named king of Spain in 1808, but his attempts at reform there were less successful. In 1813 he abdicated and returned to France. After Napoleon's defeat at Waterloo, Joseph lived in the U.S. (1815-32) and later settled in Italy.

Bonaparte, Louis (b. Sept. 2, 1778, Ajaccio, Corsica — d. July 25, 1846, Livorno, Italy) French nobleman and soldier. A brother of Napoleon, he accompanied Napoleon on the Italian campaign of 1796-97 and was his aide-de-camp in Egypt (1798-99). At Napoleon's insistence, he married Hortense de Beauharnais in 1802, but the union proved unhappy and did not last. Proclaimed king of Holland in 1806, he was criticized by Napoleon for being too easy on his subjects. His unwillingness to join the Continental System led him into conflict with Napoleon, and in 1810 he fled his kingdom and eventually settled in Italy. Napoleon III was his son.

Bonaparte, Lucien (b. May 21, 1775, Ajaccio, Corsica — d. June 29, 1840, Viterbo, Italy) French nobleman and politician. A brother of Napoleon, he became president of the Council of Five Hundred, and he helped Napoleon seize power in the Coup of 18-19 Brumaire. Lucien' s belief that Napoleon's ambition jeopardized the cause of democracy led to strained

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relations between the brothers. However, he offered Napoleon help during the Hundred Days and was the last to defend Napoleon's prerogatives at the time of his second abdication, after which he lived in Italy.

Bonaparte, (Marie-) Pauline (b. Oct. 20, 1780, Ajaccio, Corsica — d. June 9, 1825, Florence) French noblewoman. A sister of Napoleon, in 1797 she married one of his staff officers, Gen. C.V.E. Leclerc (1772-1802). After Leclerc's death, she married Prince Camillo F.L. Borghese (1803) and went with him to Rome. She soon tired of him and returned to Paris, where her behaviour caused some scandal. In 1806 she received the title of duchess of Guastalla. She died of cancer in Florence.

Bonaventure Vba-no-'ven-chsrV Saint (b. 1217, Bagnoregio, Papal States — d. July 15, 1274, Lyon; canonized April 14, 1482; feast day July 15) Italian medieval theologian, cardinal, and minister general of the Franciscans. The son of a physician from near Viterbo, he recovered from a near-fatal childhood illness through the intercession of St. Francis of Assisi. After study at the University of Paris, he entered the Franciscan order in 1244. In 1254 he assumed control of the Franciscan school in Paris. He defended the mendicants against the charge that they defamed the Gospels by begging for alms. Elected Franciscan minister-general in 1257, he healed an incipient rift between those who favoured a rigorous approach to poverty and those favouring a looser regimen, and he wrote a new life of St. Francis. His theological works include a commentary on the Sentences of Peter Lombard and Journey of the Mind to God (1259). Pope Gregory X appointed him cardinal of Albano (Italy) in 1273, and at the Second Council of Lyon he reconciled parish clergy with the mendicant orders.

bond In construction, the systematic arrangement of bricks or other building units (e.g., concrete blocks, glass blocks, or clay tiles) to ensure stability. Units laid with their ends toward the face of a wall are called headers; units with their lengths parallel to the wall are called stretchers. Common types are the English bond (courses of stretchers and headers alternate), the Flemish or Dutch bond (headers and stretchers are laid alternately within each course, each header being centered over the stretcher below it), and the American bond (every fifth or sixth course consists of headers, the rest being stretchers). See also masonry.

bond In finance, loan contract issued by local, state, and national governments and by private corporations, specifying an obligation to return borrowed funds. The issuer promises to pay interest on the debt when due (usually semiannually) at a stipulated percentage of the face value and to redeem the face value of the bond at maturity in legal tender. Bonds usually indicate a debt of substantial size and are issued in more formal fashion than promissory notes, ordinarily under seal. Government bonds may be backed by taxes, or they may be revenue bonds, backed only by revenue from the specific project (toll roads, airports, etc.) to which they are committed. Bonds are rated based on the issuer's creditworthiness. The ratings, assigned by independent rating agencies, generally run from AAA to D; bonds with ratings from AAA to BBB are regarded as suitable for investment. See also junk bond.

bond In law, a formal written agreement by which a person undertakes to perform a certain act (e.g., appearing in court or fulfilling the obligations of a contract). Failure to perform the act obligates the person to pay a sum of money or to forfeit money on deposit. A bond is an incentive to fulfill an obligation; it also provides reassurance that compensation is available if the duty is not fulfilled. A surety usually is involved, and the bond makes the surety responsible for the consequences of the obligated

person’s behaviour. See also bail.

Bond, (Horace) Julian (b. Jan. 14, 1940, Nashville, Tenn., U.S.) U.S. politician and civil-rights leader. The son of prominent educators, Bond graduated from Morehouse College. In 1960 he helped create the Student Nonviolent Coordinating Committee (SNCC). In 1965 he was elected to the Georgia legislature, but his support of a SNCC statement accusing the U.S. of violating international law in the Vietnam War caused the legislature to deny him his seat. He was twice reelected and was twice more refused entry. The U.S. Supreme Court ruled his exclusion unconstitutional in December 1966, and he assumed his seat in January 1967. He later served in the state senate (1975-87). In 1998 he became chairman of the NAACP.

bonding Any of the interactions that account for the association of atoms into molecules, ions, crystals, metals, and other stable species. When

atoms’ nuclei and electrons interact, they tend to distribute themselves so that the total energy is lowest; if the energy of a group arrangement is lower than the sum of the components’ energies, they bond. The physics and mathematics of bonding were developed as part of quantum mechanics. The number of bonds an atom can form — its valence — equals the number of electrons it contributes or receives. Covalent bonds form molecules; atoms bond to specific other atoms by sharing an electron pair between them. If the sharing is even, the molecule is not polar; if it is uneven, the molecule is an electric dipole. Ionic bonds are the extreme of uneven sharing; certain atoms give up electrons, becoming cations. Other atoms take up the electrons and become anions. All the ions are held together in a crystal by electrostatic forces. In crystalline metals, a diffuse electron sharing bonds the atoms (metallic bonding). Other types include hydrogen bonding; bonds in aromatic compounds; coordinate covalent bonds; multicentre bonds, exemplified by boranes (boron hydrides), in which more than two atoms share electron pairs; and the bonds in coordination complexes (see transition element), still poorly understood. See also VAN DER WAALS FORCES.

Bonds, Barry in full Barry Lamar Bonds (b. July 24, 1964, Riverside, Calif.) U.S. baseball player. Bonds was a college All-American at Arizona State University. A left-handed power hitter and a superb base stealer, he played outfield for the Pittsburgh Pirates (1985-92) and the San Francisco Giants (from 1993). By the early 21st century, he had earned eight Gold Glove awards for fielding and had been named Most Valuable Player six times. In 2001 he hit 73 home runs, breaking Mark McGwire’s single-season record of 70; that year he also had 177 walks to top Babe Ruth’s record (170). His father, Bobby Bonds (1946-2003), was also an outstanding professional baseball player.

bone Rigid connective tissue of vertebrates, consisting of cells embedded in a hard matrix. Bones serve as the body’s supporting framework, provide muscle-attachment points for movement, protect the internal organs, house the blood-cell formation system (red bone marrow), and hold about 99% of the calcium vital to many body processes. Bone consists of a matrix of crystals of calcium, chiefly the phosphate and carbonate, embedded among collagen fibres, providing strength and elasticity, and bone cells (less than 5% of its volume). An external layer of compact bone surrounds a central area of spongy bone, except at the marrow cavity. Bone does not grow by cell division; instead, different types of bone cells gen-

erate bone matrix, break it down, and maintain it. Bone is remodeled by this process, which strengthens it in areas under greatest stress, permits healing of fractures, and helps regulate calcium levels in body fluid (see

Q.

as

~o

physis (growth plate) epiphysis

compact bone
Haversian

medullary
containing marrow

Haversian

canal

Volkmann

canal

periosteum

osteocyte

cancellous
(spongy) bone

compact

cancellous
(spongy) bone

metaphysis

Internal structure of a human long bone, with a magnified cross section of the interior. The central tubular region of the bone, called the diaphysis, flares outward near the end to form the metaphysis, which contains a largely cancellous, or spongy, interior. At the end of the bone is the epiphysis, which in young people is

separated from the metaphysis by the physis, or growth plate. The periosteum is a connective sheath covering the outer surface of the bone. The Haversian system, consisting of inorganic substances arranged in concentric rings around the Haversian canals, provides compact bone with structural support and allows for metabolism of bone cells. Osteocytes (mature bone cells) are found in tiny cavities between the concentric rings. The canals contain capillaries that bring in oxygen and nutrients and remove wastes. Transverse branches are known as Volkmann canals.

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calcium deficiency). The process also causes underutilized bone, as in an immobilized limb, to atrophy. Bone disorders include rheumatoid arthritis, osteoarthritis, rickets, osteoporosis, and tumours. Bone can fracture suddenly or over time, as in stress fractures.

Bone See Annaba

bone china Hard-paste porcelain containing bone ash. It was developed by Josiah Spode (1754-1827) in England c. 1800. The addition of bone ash to china stone and china clay (i.e., hard china) made bone china easier to manufacture; it is stronger, does not chip easily, and has an ivory-white colour that lends itself to decoration. Other factories (Minton, Derby, Worcester, Wedgwood, Rockingham) adopted the formula in the early 19th century. Bone china remains popular for tableware in Britain and the U.S. See also STONEWARE.

bone marrow or myeloid tissue Soft, gelatinous tissue that fills bone cavities. Red bone marrow contains stem cells, progenitor cells, percursor cells, and functional blood cells (see reticuloendothelial system). Lymphocytes mature in the lymphoid organs (see lymphoid tissue). All other blood-cell formation occurs in red marrow, which also takes part in destruction of old erythrocytes (red blood cells). Yellow bone marrow mainly stores fats. Because the leukocytes (white blood cells) produced in bone marrow are involved in immune defenses, marrow transplants can treat some types of immunodeficiency. Radiation and some anticancer drugs can damage marrow and impair immunity. Bone-marrow examination helps diagnose diseases related to blood and blood-forming organs.

bonefish Marine game fish (Albula vulpes) that inhabits coastal and

island waters in tropical seas and is admired by anglers for its speed and strength. Its maximum length is about 30 in. (76 cm), and its maximum weight is 14 lbs (6.4 kg). The bonefish has a deeply notched caudal fin (near the tail) and a small mouth beneath a pointed, piglike snout. It grubs on the bottom for worms and other food.

bongo Large, brightly coloured antelope (Boocercus , or Taurotragus, eurycerus) found in dense forests of central Africa. Shy, swift, and elusive, the bongo lives in small groups or in pairs. It stands about 51 in. (1.3 m) at the shoulder and has an erect mane running the length of the back.

Both sexes bear heavy, spirally twisted horns. The male is reddish brown to dark mahogany with black underparts, black-and-white legs, white head markings, and narrow, vertical white stripes on the body.

The female is similarly marked but usually a brighter reddish brown.

Bonheur \ba-'nor\, Rosa (b. March 16, 1822, Bordeaux, France — d. May 25, 1899, Melun) French animal painter. She was trained by her father, an art teacher, and began exhibiting regularly at the Paris Salon in 1841. Her unsentimental paintings of lions, tigers, horses, and other animals became very popular; The Horse Fair (1853) gained her an international reputation. A colourful personality, she dressed as a man to study horses at the actual Horse Fair in Paris, receiving formal permission from the police to do so. In 1865 she became the first woman to receive the Grand Cross of the Legion of Honour.

Bonhoeffer Vbon-.hce-fsrV Dietrich (b. Feb. 4, 1906, Breslau, Ger. — d. April 9, 1945, Flossenbiirg) German Lutheran pastor and theologian. He attended the Universities of Berlin and Tubingen, and from 1931 he lectured in theology at the University of Berlin. He became a leading spokesman for the Confessing Church and was active in the resistance movement under the guise of employment in military intelligence. He was arrested and imprisoned in 1943. The discovery of documents

connecting him with the 1944 attempt on Adolf Hitler’s life led to his execution a month before the end of World War II. One of the most insightful theologians of the 20th century, he argued for a new vision of Christianity that would abolish the division between the sacred and profane and abandon the traditional privileges of the church in favour of active involvement in the world’s problems. His best-known works include The Cost of Discipleship (1937), Ethics (1949), and Letters and Papers from Prison (1951).

Boniface Vba-no-fosV Saint (b. 675, Wessex, Eng. — d. June 5, 754, Dokkum, Frisia; feast day June 5) English missionary and reformer. Originally named Wynfrith, he became a Benedictine monk and then a priest. He made two attempts to convert the Frisian Saxons; in 718 he journeyed to Rome, where Pope Gregory II entrusted him with a mission to the pagans east of the Rhine and gave him the name Boniface. In 722 at Hesse

he founded the first of many Benedictine monasteries. He was active for 10 years (725-735) in Thuringia. He established four bishoprics in Bavaria, paving the way for its incorporation into the Carolingian empire. He convened five synods (740-745) to reform the Frankish clergy and Irish missionaries and a council (747) to reform the entire Frankish kingdom. He was killed by a band of Frisians while reading the Bible to recent converts.

Boniface of Querfurt, Saint See Saint Bruno of Querfurt

Boniface VIII orig. Benedict Caetani (b. c. 1235, Anagni, Papal States — d. Oct. 11, 1303, Rome) Pope (1294-1303). Bom into an influential Roman family, Caetani studied law in Bologna and rose through the papal government to become cardinal-deacon (1281) and pope. In 1296 his attempt to end hostilities between Edward I of England and Philip IV of France became embroiled in the issue of taxation of clergy without papal consent. When Boniface issued a bull forbidding such taxation, Philip fought back with economic measures. They clashed again in 1301 over control of the clergy when Philip had a French bishop tried and imprisoned. Eventually, hearing that Boniface planned to excommunicate Philip, Philip's supporters captured the pope; though rescued two days later, he died shortly thereafter.

Bonifacio, Jose See Jose Bonifacio de Andrada e Silva

Bonin \'bo-nin\ Islands Japanese Ogasawara-shoto \o-,ga-sa-'war-a-'sho-to\ Island group, western Pacific Ocean. Administratively part of Japan and located about 600 mi (950 km) south of Tokyo, the group consists of islands with a total area of about 40 sq mi (100 sq km). The Bonins include some 30 mountainous islands such as Chichi (the largest), Haha, Muko, and Yome. They were colonized in 1830 by a group of Europeans and Hawaiians. The islands were formally annexed by Japan in 1876; they were administered by the U.S. in 1945-68.

Bonington Vba-nirj-tonX, Richard Parkes (b. Oct. 25, 1801, Arnold, Eng. — d. Sept. 23, 1828, London) British painter active in France. In 1818 he went to Paris to study with Antoine-Jean Gros. His skill in watercolour, a novelty in Paris, attracted many imitators. He exhibited at the famous "English" Salon of 1824 and won a gold medal. With John Constable and J.M.W. Turner, he popularized the oil sketch, a rapidly executed record of the transitory effects of nature. He became influential in England and France as a master of the Romantic movement and a technical innovator. His death at age 26 cut short a brilliant career.

bonito \b3-'ne-to\ Swift, predaceous schooling fishes (genus Sarda) of the mackerel family (Scombridae). Bonitos, found worldwide, have a striped back and silvery belly and grow to about 30 in. (75 cm) long. Like tunas, they are streamlined, with a narrow tail base, a forked tail, and a row of small finlets behind the dorsal and anal fins. Bonitos have both commercial and sporting value. The three generally recognized species are found in the Atlantic and Mediterranean, the Indo-Pacific, and the Pacific.

Bonn City (pop., 2002 est: city, 306,000; metro, area, 878,700), Germany. Located on the Rhine River south of Cologne, it was, until 1990, the capital of West Germany. An old settlement that predated the coming of the Romans, its name was continued in Castra Bonnensia, a lst-century Roman fortress. By the 9th century it had become the Frankish town of

Bonnburg. It grew from the 13th century, becoming capital of the Electorate of Cologne. In 1815 Bonn was awarded to Prussia by the Congress of Vienna, and by the late 19th century it was a fashionable residential town. It was bombed heavily in World War II; its postwar redevelopment was accelerated when in 1949 it was chosen as West Germany's capital.

Wedgwood bone china plate, Staffordshire, 1 815-20; in the Victoria and Albert Museum, London.

COURTESY OF THE VICTORIA AND ALBERT MUSEUM, LONDON: PHOTOGRAPH, EB INC.

Bongo (Boocercus euryceros).

TOM MCHUGH/PHOTO RESEARCHERS

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With Germany's reunification in 1990, the national capital was moved to Berlin. Bonn was the birthplace of Ludwig van Beethoven.

Bonnard \bo-'nar\, Pierre (b. Oct. 3, 1867, Fontenay-aux-Roses, Fr. — d. Jan. 23, 1947, Le Cannet) French painter and printmaker. He studied at the Academie Julian and the Ecole des Beaux- Arts (1888-89). In the 1890s he became a leading member of the Nabis group and came under the influence of Art Nouveau and Japanese prints. With his friend Edouard Vuillard, he developed the intimate domestic interior scene, a genre known as Intimism, depicting fashionable Parisian life in the years before World War I. He also produced still lifes, self-portraits, seascapes, and large-scale decorative paintings. In 1910 he discovered the south of France and began a series of luminous landscapes of the Mediterranean region. He was fascinated by perspective, which he employed in paintings such as The Dining Room (1913). From the 1920s he specialized in landscapes, interiors, views of gardens, and bathing nudes. He produced illustrations for the celebrated journal Revue blanche and decorative pages for Paul Verlaine's book of poetry Parallelement (1900). Bonnard was one of the greatest colourists of modem art.

Bonnefoy, Yves (b. June 24, 1923, Tours, France) French poet. A student of mathematics, Bonnefoy moved to Paris and came under the influence of the Surrealists. His poetry describes a thought universe brought to life by an intuition of the "real world." Among his poetry collections are In the Shadow's Light (1987), The Beginning and End of Snow (1991), and New and Selected Poems (1995). Bonnefoy, also a scholar, compiled Mythologies (1981), a dictionary of mythologies and religions. He held the

chair in comparative poetics at the College de France from 1981 to 1994.

Bonnet \bo-'naV Georges-Etienne (b. July 23, 1889, Bassillac, France — d. June 18, 1973, Paris) French politician. Elected to the Chamber of Deputies (1924-40), he became a leader of the Radical- Socialist Party. He served as finance minister (1937-38) and foreign minister (1938-39) and was a prominent supporter of appeasement of Nazi Germany. He also supported the Vichy regime. After the liberation, proceedings against him were started but dropped. He was expelled from the Radical Party in 1944, readmitted in 1952, and again expelled in 1955. He later served in the Chamber of Deputies (1956-68).

bonnet monkey Agile Indian macaque (Macaca radiata) named for the thatch of long hair forming a cap, or “bonnet,” on the crown. It is grayish brown and has a hairless pink face. It is 14-24 in. (35-60 cm) long, excluding its 20-28-in. (50-70-cm) tail, and weighs 7-20 lbs (3-9 kg). It sometimes raids gardens or stores of food.

Bonnie and Clyde in full Bonnie Parker and Clyde Barrow (respectively b. March 24, 1909, Telico, Texas, U.S. — d. May 23, 1934, near Gibsland, La.; b. Oct. 1, 1910, Rowena, Texas, U.S. — d. May 23, 1934, near Gibsland, La.)

U.S. criminals. After Barrow spent time in prison (1930-32), he and Parker began a 21 -month crime spree, robbing gas stations, restaurants, and small-town banks in Texas, Oklahoma, New Mexico, and Missouri and murdering a number of people. Their exploits received wide coverage in the press. Betrayed by a friend, they were ambushed by police officers along a highway in Gibsland, La.; as they attempted to flee, police opened fire, killing them. Their exploits inspired numerous books and films.

Bonnie Prince Charlie See Charles Edward, the Young Pretender

bonobo \b3-'no-bo\ Species (Pan paniscus) of great ape. It was once considered a subspecies of the chimpanzee, which it closely resembles in size, appearance, and way of life. Its range, the lowland rainforests of central Congo (Kinshasa), is more restricted than that of the chimpanzee, and it has longer, more slender arms, a more slender body, and a less protruding face. Bonobos eat mainly fruits but also leaves, seeds, grass, and small animals. They form communities of 50-120 individuals. A striking feature of their social lives is that they engage in sexual activity with great

frequency, often as a means of settling quarrels, and with little regard for gender or age. Populations are shrinking, largely because of hunting and habitat destruction, and bonobos are an endangered species.

Bononcini 'v.bo-non-'che-neV Giovanni (b. July 18, 1670, Modena, Duchy of Modena — d. July 9, 1747, Vienna) Italian composer. His father was Giovanni Maria Bononcini (1642-78), maestro di cappella of Modena Cathedral and the composer of numerous church and chamber sonatas. Giovanni himself served as maestro di cappella at San Giovanni in Monte; he later held desirable positions in various European capitals. In London in the 1720s he had a celebrated operatic rivalry with George Frideric Handel. He wrote more than 30 operas, some 20 oratorios, and nearly 300 cantatas (most for solo voice and continuo), but they are rarely heard today. His brother Antonio Maria Bononcini (1677-1726) was also a composer.

bonsai (Japanese: “tray planting”) Living dwarf tree or trees; also, the art of training and growing them in containers. Bonsai specimens are ordinary trees and shrubs, not heredi- tary dwarfs; they are dwarfed by a system of pruning roots and branches and training branches by tying them with wire. The art origi- nated in China but has been pursued and developed primarily by the Japa- nese. The direct inspiration for bon- sai is found in nature, in trees that grow in harsh, rocky places and are dwarfed and gnarled throughout their existence. Prized characteristics are an aged-looking trunk and branches and weathered-looking exposed upper roots. Bonsai may live for a century or more and are handed down from one generation to another as valued family possessions. Bonsai pots, usually earthenware and of variable shape, are carefully chosen to harmonize in colour and propor- tion with the tree. A sizable bonsai industry exists as part of the nursery industry in Japan; California is home to a small-scale bonsai industry.

Bontemps\ban-'tam\, Arna(ud) (Wendell) (b. Oct. 13, 1902, Alex- andria, La., U.S. — d. June 4, 1973, Nashville, Tenn.) U.S. writer of the Harlem Renaissance. At age three Bontemps moved with his family to California. His poetry began appearing in the black magazines Crisis and Opportunity in the 1920s. With Countee Cullen he turned his first novel, God Sends Sundays (1931), into the play St. Louis Woman. Two later nov- els dealt with slave revolts. He edited anthologies with Langston Hughes and wrote prolifically for children, mostly nonfiction works on African Americans and African American history. He worked at Fisk University for most of his adult life.

Bonus Army World War I veterans who gathered in Washington, D.C., in summer 1932 to demand payment of their promised bonuses. More than 12,000 veterans and their families camped near the U.S. Capitol, urging support for a bill to force early payment of bonuses already voted by Congress. When the bill was defeated, most of the crowd returned home, but some angry protests caused local authorities to ask Pres. Herbert Hoover for federal assistance. Army troops led by Gen. Douglas Mac- Arthur drove out the protesters and burned their camps. The resulting

public outcry was a factor in Hoover’s defeat in the 1932 election. Another group of veterans gathered in 1933, but Congress again rejected bonus legislation. In 1936 Congress finally enacted a bill that paid nearly $2 billion in veterans’ benefits.

bony fish Any member of the vertebrate class Osteichthyes, including the great majority of living fishes and all the world’s sport and commercial fishes. Also called Pisces, the class excludes jawless fishes (hagfishes and lampreys) and cartilaginous fishes (sharks, skates, and rays). There are more than 20,000 species worldwide, all with a skeleton at least partly composed of true bone. Other features include, in most species, a swim bladder (an air-filled sac to give buoyancy), gill covers over the gill chamber, bony platelike scales, a skull with sutures, and external fertilization of eggs. Bony fishes occur in all freshwater and ocean environments.

booby Any of six or seven species of large tropical seabirds (family Sulidae), named for their presumed lack of intelligence. Two common species are wide-ranging in the Atlantic, Pacific, and Indian oceans;

Bonnet monkey (Macaca radiata).

WARREN GARST/TOM STACK & ASSOCIATES

Bonsai pine.

JUDITH GROFFMAN

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another is found in the Pacific from southern California to northern Peru and on the Galapagos Islands. The booby has a long bill, cigar-shaped body, and long, narrow, angular wings. It flies high above the ocean looking for schools of fish and squid, which it snatches in a vertical dive. Boobies vary in length from 25 to 35 in. (65-85 cm). They nest in colonies but are territorial.

book Written (or printed) message of considerable length, meant for circulation and recorded on any of various materials that are durable and light enough to be easily portable. The papyrus roll of ancient Egypt is more nearly the direct ancestor of the modern book than is the clay tablet; examples of both date to c. 3000 bc. Somewhat later, the Chinese independently created an extensive scholarship based on books, many made of wood or bamboo strips bound with cords. Lampblack ink was introduced in China c. ad 400 and printing from wooden blocks in the 6th century. The Greeks adopted the papyrus roll and passed it on to the Romans. The parchment or vellum codex superseded the papyrus roll by ad 400. Medieval parchment or vellum leaves were prepared from the

skins of animals. By the 15th century, paper manuscripts were common. Printing spread rapidly in the late 15th century. Subsequent technical achievements, such as the development of offset printing, improved many aspects of book culture. In the late 1990s, downloadable electronic books became available over the Internet.

book club Marketing service that offers books to subscribers through the mail, often at reduced prices. The first U.S. book club, the Book-of-the-Month Club, was founded in 1926; the rival Literary Guild appeared a year later. By the 1980s nearly 100 book clubs existed in the U.S. , most of them specialized (e.g., for history books, mysteries, etc.). A common incentive for attracting new members is the offer of several free or heavily discounted books; long-standing members often receive bonuses.

Book of Common Prayer Liturgical book used by the churches of the Anglican Communion. First authorized for the Church of England in 1549, it went through several versions; the 1662 revision has remained the standard (with minor changes) throughout the Commonwealth of Nations. The Church of England and the Protestant Episcopal Church in the U.S. adopted a liturgy in contemporary language in the 1970s.

Book of Kells Illuminated manuscript version of the four Gospels, c. late 8th-early 9th century. A masterpiece of the ornate Hiberno- Saxon style, it features geometric design (rather than naturalistic representation), flat areas of colour, and complex interlaced patterns. The illumination was probably begun at the Irish monastery on the Scottish island of Iona; the book was apparently taken to the monastery of Kells in County Meath, Ire., after a Viking raid and may have been completed there. See also Lindisfarne Gospels.

Book of the Dead Ancient Egyptian collection of mortuary texts made up of spells and charms and placed in tombs to aid the deceased in the next world. It was probably compiled and reedited during the 16th century bc. Later compilations included hymns to Re. Scribes produced and sold copies, often colorfully illustrated, for burial use. Of the many extant copies, none contains all of the approximately 200 known chapters.

bookbinding Joining together of leaves of paper, parchment, or vellum within covers to form a book or codex. Bookbinding developed when the codex replaced the roll. Early bindings were often splendidly decorated, but the typical artistic bookbinding is of decorated leather and was first produced in the monasteries of Egypt’s Coptic Church. Rare books, historical documents, and manuscripts may be bound by hand. The cover (case) of the typical book is now affixed to the leaves by machine.

bookcase Piece of furniture fitted with shelves, formerly often enclosed by doors. In early times the ambry, or wall cupboard, was used to hold books. Bookcases were included in the medieval fittings of college libraries in Britain. The earliest dated domestic examples were made of oak in 1666 for the diarist Samuel Pepys.

Booker Prize in full (2002-) Man Booker Prize Prestigious British award given annually to a full-length novel. It was established in 1968 by the multinational company Booker McConnell as a counterpart to the French Prix Goncourt. The Booker Prize Foundation administers the prize, aided by an advisory committee. Entries, which are nominated by publishers, must be written by an English-language author from the United Kingdom, the Commonwealth countries, Ireland, or South Africa. Its winners

have included Kingsley Amis, A.S. Byatt, Ruth Prawer Jhabvala, and Salman Rushdie. In 1992 a Booker Russian Novel Prize was introduced.

bookkeeping Recording of the money values of business transactions. Bookkeeping provides the information from which accounts are prepared but is distinct from accounting. Bookkeeping offers information on both the current value, or equity, of an enterprise and on its change in value (due to profit or loss) over a given time period. Managers require such information to examine the results of operations and budget for the future; investors need it to make decisions about buying or selling securities; and credit grantors use it to determine whether to grant a loan. Financial records were kept in Babylon and in ancient Greece and Rome. The double-entry method of bookkeeping began with the development of the Italian commercial republics of the 15th century. The Industrial Revolution stimulated the spread of bookkeeping, and 20th-century taxation and government regulations made it a necessity. Two types of records continue to be used in bookkeeping — journals and ledgers. They can be recorded by hand or entered into a computer. The journal contains daily transactions (sales, purchases, etc.), while the ledger contains the record of individual accounts. Each month an income statement and a balance sheet are posted in the ledger.

bookmaking Gambling practice of determining odds and receiving and paying off bets on the outcome of sporting events and other competitions. Horse racing is perhaps most closely associated with bookmaking, but boxing, baseball, football, basketball, and other sports have also long been of interest to bookmakers (“bookies”) and gamblers. Morning-line odds, established by legal bookmakers, are printed in the sports sections of newspapers throughout the U.S. Illegal bookmaking operations have often been linked to organized crime. See also handicap.

bookplate Label with a printed design pasted inside the front cover of a book to identify its owner. It probably originated in Germany in the mid- 15th century; the earliest extant dated bookplate (15 16) is German. The earliest American example is dated 1749. Bookplate designs include portraits, views of libraries, and landscapes, as well as symbols of the owner’s interests or occupation (e.g., military trophies, palettes), and, toward the end of the 19th century, nude figures.

Boole, George (b. Nov. 2, 1815,

Lincoln, Eng. — d. Dec. 8, 1864, Ballintemple, Ire.) British mathematician. Though basically self-taught and lacking a university degree, in 1849 he was appointed professor of mathematics at Queen’s College in Ireland. His original and remarkable general symbolic method of logical inference is fully stated in Laws of

Thought (1854). Boole argued persuasively that logic should be allied with mathematics rather than with philosophy, and his two-valued algebra of logic, now called Boolean algebra, is used in telephone switching and by electronic digital computers.

Boolean algebra Symbolic system used for designing logic circuits and networks for digital computers. Its chief utility is in representing the truth value of statements, rather than the numeric quantities handled by ordinary algebra. It lends itself to use in the binary system employed by digital computers, since the only possible truth values, true and false, can be represented by the binary digits 1 and 0. A circuit in computer memory can be open or closed, depending on the value assigned to it, and it is the integrated work of such circuits that

Jane Patterson's bookplate designed by Robert Anning Bell, English, 1 890s

COURTESY OF THE VICTORIA AND ALBERT MUSEUM, LONDON

George Boole, engraving.

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give computers their computing ability. The fundamental operations of Boolean logic, often called Boolean operators, are “and,” “or,” and “not”; combinations of these make up 13 other Boolean operators.

boomerang Curved throwing stick used chiefly by the aborigines of Australia for hunting and warfare. About 12-30 in. (30-75 cm) in length, the returning boomerang varies in shape from a deep curve to almost straight sides of an angle. The ends are twisted or skewed in opposite directions. It is held at one end, above and behind the thrower’s shoul-

der, and swung forward rapidly. Just before release, the thrower adds spin by flicking the wrist so that the stick will loop around and return to him. Returning boomerangs were used only in eastern and western Australia as playthings, in tournament competition, and by hunters to imitate hawks for driving flocks of game birds into nets. The longer, straighter, and heavier nonreturning boomerang can kill animals and even humans.

boomslang Venomous snake (. Dispholidus typus) of the savannas of sub-Saharan Africa, the only species of its family that is decidedly dangerous to humans. When hunting, it lies in wait in a bush or tree for chameleons and birds; the forepart of the body often extends motionless into the air. The boomslang’ s body and eye colours are extremely variable and provide excellent camouflage. In defense it inflates its neck, showing the dark skin between the scales, and then may strike. Its venom causes hemorrhages and can be fatal to humans in small amounts.

Boone, Daniel (b. c. Nov. 2,

1734, Berks county, Pa. — d. c. Sept.

26, 1820, St. Charles, Mo., U.S.)

U.S. frontiersman and legendary hero. He lived on the North Carolina frontier as a hunter and trapper. He made several trips through the Cumberland Gap into eastern Kentucky (1767, 1769-71) and in 1775 was employed to blaze a permanent trail, called the Wilderness Road. He established the settlements of Boonesboro and Harrodsburg. As a militia captain he defended Boonesboro against the Indians; he was captured by the Shawnee in 1778 but escaped after five months to warn Boonesboro of an impending attack. After losing his Kentucky land claims in the late 1780s, he moved to the Missouri Territory. His exploits were featured in a widely read history of Kentucky and in Lord Byron’s epic poem Don Juan.

Boorman, John (b. Jan. 18, 1933, Shepperton, Middlesex, Eng.) British film director. As head of the BBC’s documentary film unit in Bristol (1962-64) he produced the acclaimed Citizen 63 series. After directing his first feature film in 1965, Boorman directed Point Blank (1967) and Hell in the Pacific (1968) in the U.S. His successful Deliverance (1972) was a harrowing tale of endurance and survival. Later films include Excalibur (1981) and Hope and Glory (1987).

Booth, Edwin (Thomas) (b.

Nov. 13, 1833, near Belair, Md.,

U.S. — d. June 7, 1893, New York,

N.Y.) U.S. actor. Bom into a noted theatrical family, he played his first

starring roles in Boston and New York City in 1857. He became famous as Hamlet, appearing in the role for 100 consecutive nights in 1864-65. When his brother John Wilkes Booth assassinated Pres. Abraham Lincoln, Edwin withdrew from the stage until 1866. In 1869 he opened his own theatre, but mismanagement forced him to sell it in 1873.

His interpretations of Hamlet, Iago, and King Lear won great acclaim in England and Germany. He founded the Players' Club in New York in 1888.

Booth, John Wilkes (b. May 10, 1838, near Bel Air, Md., U.S. — d. April 26, 1865, near Port Royal, Va.) U.S. actor and assassin of Pres. Abraham Lincoln. Born into a family of famous actors, he achieved success in Shakespearean roles but resented the greater acclaim enjoyed by his brother, Edwin Booth. A fanatical believer in slavery and the Southern cause, he made plans with co-conspirators to abduct Lincoln; after several failed attempts, he vowed to destroy the president and his cabinet. On April 14, 1865, he shot Lincoln during a performance at Ford's Theatre. Though he broke his leg jumping from the president's box, he was able to escape on horseback to a Virginia farm. Tracked down, he refused to surrender and was shot, either by a soldier or by himself.

Booth, William (b. April 10, 1829, Nottingham, Nottinghamshire, Eng. — d. Aug. 20, 1912, London) British religious leader, founder and general (1878-1912) of the Salvation Army. At age 15 he underwent a religious conversion and became a revivalist preacher. In 1849 he went to London, where he became a regular preacher of the Methodist New Connection (1852-61) and then an independent revivalist. Aided by his wife, Catherine Mumford Booth (1829-90), a fellow preacher and social worker, he founded the Christian Mission in 1865, which in 1878 became the Salvation Army. He traveled worldwide to lecture and organize branches of the Army. His proposals for remedying social ills received widespread acceptance and the encouragement of Edward VII.

Boothia Peninsula Peninsula, Nunavut, Canada. Almost an island, it is the northernmost point of the North American mainland, reaching 71°58' N, and was formerly the location of the north magnetic pole. With an area of 12,483 sq mi (32,330 sq km), it extends into the Arctic Ocean and is separated from Baffin Island by the Gulf of Boothia and from Prince of Wales Island by the Franklin Strait. It was discovered in 1829 by James Clark Ross, who named it Boothia Felix for Sir Felix Booth, the expedition's financier. It is sparsely populated.

bootlegging Illegal traffic in liquor in the U.S. The term was probably first used to describe the practice of concealing flasks of illicit liquor in boot tops when going to trade with Indians. It became widely used in the 1920s when the 18th Amendment to the Constitution and the Volstead Act of 1919 effected the prohibition of liquor manufacturing and sales. Early bootleggers smuggled foreign-made liquor into the U.S. from Canada and

Mexico and from ships anchored in international waters. Later sources included medicinal whiskey, denatured alcohol, and the manufacture of com liquor. Bootlegging led to the rise of organized-crime syndicates that controlled operations from the manufacture of liquor to its distribution in restaurants and speakeasies. In 1933 Prohibition was repealed by the 21st Amendment. Some counties and municipalities continue to ban liquor, and bootlegging is still practiced.

bop See bebop

Bophuthatswana V.bo-pu-ta-'tswa-naV Former political entity, South Africa. Consisting of a group of noncontiguous black enclaves, it was established by South African authorities as a “homeland” for the Tswana people and granted its independence in 1977, with its capital at Mma-batho. It was never internationally recognized as independent. Under the 1993 South African constitution, Bophuthatswana was dissolved and the area was reincorporated into South Africa. Its various enclaves, with a population of more than 2,500,000, became parts of Orange Free State (now Free State) and the newly created North-West and Eastern Trans-vaal (now Mpumalanga) provinces.

Bopp Vbop\, Franz (b. Sept. 14, 1791, Mainz, archbishopric of Mainz — d. Oct. 23, 1867, Berlin, Prussia) German linguist. He published the first lengthy comparative analysis of Indo-European languages, his voluminous Comparative Grammar of Sanskrit, Zend, Latin, Lithuanian, Old Slavic, Gothic, and German (1833-52). Though the relation of San-skrit to European languages was known at the time, Bopp was a pioneer in isolating common elements in the verbal and nominal morphology of Sanskrit and other older Indo-European languages. Most of his career was spent at the University of Berlin.

borage Large hairy annual herb (Borago officinalis), an ornamental species with large, rough, oblong leaves and loose, drooping clusters of starlike blue flowers. It is a member of the family Boraginaceae, which contains mostly herbs but also some trees and shrubs, all found in tropi-cal, subtropical, and temperate areas and most concentrated in the Medi-terranean region. Several other ornamental species are grown in gardens, including the Virginia bluebell (Mertensia virginica), forget-me-nots.

Boomslang (Dispholidus typus)

DADE THORNTON FROM THE NATIONAL AUDUBON SOCIETY COLLECTION -PHOTO RESEARCHERS/EB INC.

Edwin Booth, photograph by Bradley and Rulofson

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heliotropes, and lungworts (Pulmo - naria). Borage is also used as an herbal and bee plant and eaten as a vegetable.

Borah, William E(dgar) (b.

June 29, 1865, Fairfield, 111.,

U.S. — d. Jan. 19, 1940, Washington,

D.C.) U.S. senator (1907-40). He practiced law in Boise, Idaho, and in 1892 became the state’s Republican Party chairman. In the Senate he wielded great power as chairman of the foreign relations committee from 1924. A champion of isolationism in foreign policy, he was best known for his role in preventing the U.S. from joining the League of Nations; he also opposed efforts to aid the Allies before the U.S. entered World War II. A maverick Republican, he supported many of the New Deal programs to relieve economic hardship and sponsored bills establishing the Department of Labor as well as the federal Children’s Bureau.

borax or tincal Vtiq-koL Sodium tetraborate decahydrate (Na 2 B 4 0 7 •10H 2 O), a soft, light, colourless crystalline mineral used as a component of glass and pottery glazes in the ceramics industry, as a solvent for metal-oxide slags in metallurgy, as a flux in welding and soldering, and as a fertilizer additive, a soap supplement, a disinfectant, a mouthwash, and a water softener. About 50% of the world’s supply comes from southern California deserts, including Death Valley.

Borch, Gerard ter See Gerard Terborch

Bordeaux \bor-'do\ City (pop., 1999: city, 215,363; metro, area, 753,931), southwestern France. Lying on the Garonne River above its junction with the Dordogne, Bordeaux has long been noted for its wine production. As Burdigala, it was the chief town of the Bituriges Vivisci, a Celtic people. Under Roman rule it was capital of Aquitania province. As part of the inheritance of Eleanor of Aquitaine, Bordeaux became English in 1154 on her husband’s accession to the English throne as Henry II. It enjoyed great prosperity through a thriving trade with the English until it was united with France on the English defeat in the Hundred Years' War (1453). As a Girondin centre, it suffered severely in the French Revolution. In 1870, during the Franco- Prussian War, the French government was transferred to Bordeaux, as it was again in 1914 at the outbreak of World War I. Its university, founded in 1441, educated such figures as Montesquieu. The economy focuses on the service sector.

Borden, Sir Frederick (William) (b. May 14, 1847, Cornwallis, Nova Scotia — d. Jan. 6, 1917, Canning, Nova Scotia, Can.) Canadian politician. After studying at Harvard University, he returned to Nova Scotia to practice medicine. In 1874 he was elected as a Liberal Party member to the House of Commons, where he served almost continuously until 1911. As minister of militia and defense (1896-1911), he improved the training of the armed services and helped create a Canadian navy.

Borden, Lizzie (Andrew) (b. July 19, 1860, Fall River, Mass., U.S. — d. June 1, 1927, Fall River) U.S. murder suspect. The daughter of a businessman, she lived with her wealthy but parsimonious father and stepmother. On Aug. 4, 1892, Lizzie (according to her testimony) discovered her father and his wife dead in their home, brutally mutilated with a sharp instrument. Lizzie and the maid admitted to being in the house at the time of the murders. Lizzie was arrested and tried for both crimes, the maid being suspected as an accomplice. Evidence against Lizzie included her attempt to buy prussic acid (a poison) the day before the murders took place. An ax, which some suspected was the murder weapon, was found in the basement. Acquitted because of the circumstantial nature of the evidence, she remained in Fall River until her death, largely ostracized by the community.

Borden, Sir Robert (Laird) (b. June 26, 1854, Grand Pre, Nova Scotia — d. June 10, 1937, Ottawa, Ont., Can.) Prime minister of Canada (1911-20). He practiced law in Halifax, Nova Scotia, from 1874 and later founded one of the largest law firms in the Maritime Provinces. In 1896 he was elected to the Canadian House of Commons; he became leader of the Conservative Party in 1901. As prime minister, he implemented conscription in World War I and represented Canada in Britain’s imperial war

Borage (Borago officinalis).

A TO Z BOTANNICAL COLLECTION/EB INC.

cabinet. He insisted on separate Canadian membership in the League of Nations, which helped transform Canada from a colony to an independent country.

border collie Breed of long-haired sheepdog that has been used along the English-Scottish border for about 300 years. Usually black and white, it stands about 20 in. (50 cm) and weighs 30-50 lbs (14-23 kg). It is the most popular working sheepdog in the British Isles.

Bordet \bor-'da\, Jules (-Jean-Baptiste-Vincent) (b. June 13, 1870, Soignies, Belg. — d. April 6, 1961, Brussels) Belgian bacteriologist and immunologist. In 1895 he found that two blood serum components cause bacteriolysis (bacterial cell-wall rupture), one a heat-stable antibody in animals immune to the bacterium and the other a heat-sensitive complement in all animals. In 1898 he discovered hemolysis (rupture of foreign erythrocytes), a similar process that also requires complement. This research was vital to the foundation of serology, the study of immune reactions in body fluids. His work with Octave Gengou led to serological tests for many diseases, including typhoid, tuberculosis, and syphilis (the Wassermann test). In 1906 they discovered Bordet ella pertussis, which causes whooping cough. In 1919 Bordet received a Nobel Prize.

Borduas Vbor-dui-'asV Paul-Emile (b. Nov. 1, 1905, Saint-Hilaire, Que., Can. — d. Feb. 22, 1960, Paris, France) Canadian painter. He was trained in Montreal as a church decorator and later studied in Paris. In the early 1940s, influenced by Surrealism, he began to produce “automatic” paintings and with Jean-Paul Riopelle founded the radical abstract group known as Les Automatistes (c. 1946-51). His later works are reminiscent of those of Jackson Pollock, but the only U.S. influence he acknowledged was that of Franz Kune. See also automatism.

boreal forest See taiga

Borg, Bjorn (Rune) (b. June 6, 1956, Sodertalje, Swed.) Swedish tennis player. Turning professional at age 14, Borg was noted for his powerful serve and two-handed backhand. He became the first man to win the Wimbledon singles championship five successive times (1976-80) since Laurie Doherty (1902-6) and the first to win the French Open four times in a row and six times in all (1974-75, 1978-81). By the time he finally lost at Wimbledon to John McEnroe (1981), he had won a record 41 straight Wimbledon singles matches. He won a lifetime total of 1 1 grand-slam titles. He retired in 1983.

Borge \'b6r-go\, Victor orig. Borge Rosenbaum (b. Jan. 3, 1909, Copenhagen, Den. — d. Dec. 23, 2000, Greenwich, Conn., U.S.) Danish-born U.S. comedian and pianist. He studied at the Copenhagen Music Conservatory and later in Vienna and Berlin. Initially performing as a concert musician, he soon developed a style that combined comedy with classical music, and he toured throughout Europe. In 1940 he immigrated to the U.S., where he achieved fame appearing in various venues, including radio, films, concert halls, Broadway, and television. Though he performed as soloist and guest conductor with many of the world’s leading orchestras, his significant pianistic talent was often overshadowed by his highly popular humour.

Borges Vbor-has\, Jorge Luis (b. Aug. Arg. — d. June 14, 1986, Geneva,

Switz.) Argentine poet, essayist, and short-story writer. Educated in Switzerland, Borges recognized early that he would have a literary career. From the 1920s on he was afflicted by a growing hereditary blindness. In 1938 a severe head wound seemed to free his deepest creative forces. His blindness was total by the mid 1950s and forced him to abandon the writing of long texts and begin dictating his works. From 1955 he held the honorary post of director of Argentina’s national library. Much of his work is rich in fantasy and metaphorical allegory, including the story collections Ficciones (1944), which

won him an international following, and The Aleph (1949). Dreamtigers (1960) and The Book of Imaginary

24, 1899, Buenos Aires,

Jorge Luis Borges.

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Beings (1967) almost erase the distinctions between prose and poetry. Though he later repudiated it, he is credited with establishing in South America the modernist Ultraist movement, a rebellion against the decadence of the established writers of the Generation of ’98.

Borghese family \bor-'ga-sa\ Noble Italian family, originally from Siena, who first gained fame in the 13th century as magistrates, ambassadors, and other public officials. They moved to Rome in the 16th century and there, after Camillo Borghese was elected (1605) as Pope Paul V, the family rose in wealth and fame. Prominent family members included the adopted Scipione Caffarelli (later Borghese) (1576-1633), a cardinal and patron of the arts, and Camillo F. L. Borghese (1775-1832), who married Pauline Bonaparte and played an important role in Franco-Italian relations.

Borgia Vb6r-ja\, Cesare later due de Valentinois \va-la n -ten-'wa\ (b. c. 1475/76, probably Rome — d. 1507, near Viana, Spain) Italian military leader, illegitimate son of Pope Alexander VI, and brother of Lucrezia Borgia. He was made archbishop of Valencia (1492) and cardinal (1493). After his brother’s murder (1497), he took command of the papal armies. In 1498 he resigned his ecclesiastical offices and married the sister of the king of Navarre, a move calculated to win French support for a campaign to regain control of the Papal States. Acting in concert with his father, Cesare won a series of military successes in the Papal States (1499-1503), gaining a reputation for ruthlessness and assassination; his political astuteness led Niccolo Machiavelli to cite him as an example of the new “Prince.” Cesare’ s gains proved fruitless, however, when his father died (1503) and the new pope, Julius II, demanded that he give up his lands. He escaped from prison in Spain and died fighting for Navarre.

Borgia, Lucrezia (b. April 18,

1480, Rome — d. June 24, 1519, Ferrara, Papal States) Italian noblewoman. The daughter of the future pope Alexander VI and sister of

Cesare Borgia, she was probably more an instrument for their ambitious projects than, as has been suggested, an active participant in their many crimes. Her three marriages into prominent families helped augment the political and territorial power of the Borgias. Her child may have been the issue of an incestuous relationship with her father. After her father’s death (1503), she ceased to play a political role and increasingly turned to religion. She died at age 39.

Borglum Vb6r-gbm\, (John)

Gutzon (de la Mothe) (b. March 25, 1867, St. Charles, Idaho,

U.S. — d. March 6, 1941, Chicago,

111.) U.S. sculptor. Born to Danish immigrant parents, he studied art in Paris. In 1901 he opened a studio in New York City. His bronze group The Mares of Diomedes was the first U.S. sculpture purchased by the Metropolitan Museum of Art. He carved the head of Abraham Lincoln in the U.S. Capitol rotunda. In 1916 he was commissioned to sculpt a memorial to the Confederacy on Stone Mountain, Ga., but disputes with his patrons caused him to abandon the project in 1924; it was completed by others. His most notable project was the Mount Rushmore National Memorial (completed 1941).

boring machine Machine tool for producing smooth and accurate holes in a workpiece by enlarging existing holes with a cutting tool, which may bear a single tip of steel,

cemented carbide, or diamond or may be a small grinding wheel. The hole’s diameter is controlled by adjusting the boring head. Bored holes are more accurate in roundness, concentricity, and parallelism than drilled holes. Boring machines used in toolmaking shops have a vertical spindle and a work-holding table that moves horizontally in two perpendicular directions so that holes can be accurately spaced. In mass-production plants, boring machines with multiple spindles are common. See also drill; drill press; lathe.

Boris I orig. Mikhail (d. May 2, 907, Preslave, Bulg.) Khan of Bulgaria (852-89). He resolved to use Christianity to unite his ethnically divided country, and an unsuccessful war with the Byzantines led to his

baptism in the Orthodox faith (864). Boris's attempt to enforce mass baptism set off a pagan rebellion, which he quelled, and he helped establish the Bulgarian church. He sponsored missionaries to foster Slavic learning and the use of the Old Church Slavic language. He abdicated in 889 to become a monk but returned to drive his reactionary son Vladimir from the throne. After installing another son, Simeon I, as khan, Boris went back to his monastery. He was later made an Orthodox saint.

Boris Godunov See Boris Godunov

Borlaug Vbor-.logV Norman (Ernest) (b. March 25, 1914, Cresco, Iowa, U.S.) U.S. agricultural scientist and plant pathologist. He earned his Ph.D. at the University of Minnesota. As a researcher with the Rockefeller Foundation in Mexico (1944-60), he developed strains of grain that tripled Mexican wheat production. Later his dwarf wheats raised harvests in Pakistan and India by 60%, ending the food shortages that had plagued the subcontinent in the 1960s. For helping lay the groundwork of the Green Revolution, he was awarded the Nobel Prize for Peace in 1970. Afterward he worked on improving crop yields in Africa and taught at Texas A&M University.

Bormann Vbor-.manX, Martin (b. June 17, 1900, Halberstadt, German Empire — d. May 1945, Berlin, Ger.) German Nazi leader. He joined the Nazi party in 1925 and served as Rudolf Hess's chief of staff (1933^11). He was appointed head of the party chancellery in 1941 and became one of Adolf Hitler's closest lieutenants. A shadowy but extremely powerful presence, Bormann controlled all legislation, party promotions and appointments, and the personal access of others to Hitler. He disappeared shortly after Hitler's death. Though some reports allege that he escaped to South America, German authorities officially declared him dead after exhuming his presumed remains.

Born, Max (b. Dec. 11, 1882, Breslau, Ger. — d. Jan. 5, 1970, Gottingen, W.Ger.) German physicist. He taught theoretical physics at the University of Gottingen from 1921 to 1933, when he fled to Britain. There he taught principally at the University of Edinburgh (1936-53). In 1921 he gave a very precise definition of quantity of heat, the most satisfactory mathematical statement of the first law of thermodynamics. In 1926 he collaborated with his student Werner Heisenberg to develop the mathematical formulation that would adequately describe Heisenberg's first laws of a new quantum theory. He later showed, in the work for which he is perhaps best known, that the solution of the Schrodinger equation has a statistical meaning of physical significance. His later work concerned the scattering of atomic particles and calculations dealing with the electronic structures of molecules. In 1954 he shared a Nobel Prize for Physics with Walther Bothe (1891-1957).

Borneo Island, Malay Archipelago. Bounded by the South China Sea, the Sulu and Celebes seas, the Makassar Strait, and the Java Sea, it is the third largest island in the world, measuring 290,320 sq mi (751,929 sq km). The northern part includes the Malaysian states of Sabah and Sarawak and the sultanate of Brunei; the southern section forms part of Indonesia. Borneo is mountainous and largely covered in dense rainforest; its highest point is Mount Kinabalu, at 13,455 ft (4,101 m). Much of it is drained

Lucrezia Borgia, detail from the fresco the "Dispute of St. Catherine, " by Pinturicchio, 1492-94; in the Vatican.

AUNARI/ART RESOURCE, NEW YORK

Gutzon Borglum.

Max Born

COURTESY OF GODFREY ARGENT; PHOTOGRAPH, WALTER STONEMAN

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by navigable rivers, including the Rajang, which are the principal lifelines of trade and commerce. It is mentioned in Ptolemy’s Guide to Geography (c. ad 150); Roman trade beads give evidence of an earlier civilization. Brahman and Buddhist images in the Gupta style indicate the influence of Indians who apparently arrived in the 5th century. With the arrival of Islam in the 16th century, various Muslim kingdoms were founded, some of which owed allegiance to Java. Around the same time, the Portuguese, followed by the Spanish, set up trading stations. In the early 17th century the Dutch broke the Portuguese- Spanish monopoly, but they in turn had to deal with newly established British interests. After World War II, Sarawak and North Borneo (later Sabah) became British crown colonies. Strong nationalist sentiment emerged in Dutch Borneo, and sovereignty passed to Indonesia in 1949. The British relinquished Sabah and Sarawak to the Malaysian federation in 1963, while Brunei became independent in 1984.

Bornholm Island (pop., 2001: 44,126), Denmark. Lying in the Baltic Sea south of Sweden, it has an area of 227 sq mi (588 sq km). Its seat is at Rpnne. Once a Viking stronghold, it was seized by the Hanseatic League in 1510. Until 1660 it was held for varying periods by Sweden and Denmark, but it has since been Danish. It is now a popular tourist resort.

bornite Common copper-ore mineral, copper and iron sulfide (Cu 5 FeS 4). Typical occurrences are found in Mount Lyell, Tasmania; Chile; Peru; and Butte, Mont. Bornite may form isometric crystals but occurs most commonly as irregular masses. Under appropriate geologic conditions, it alters to chalcocite and other copper minerals.

Bornu Historical region, northeastern Nigeria. Prominent physical features include a vast plain, a volcanic plateau, and swamps south of Lake Chad. Now inhabited chiefly by the Kanuri people, it constituted a Muslim kingdom from about the 11th century. Together with Kanem it later formed an empire (see Kanem-Bornu), which reached the height of its power c. 1570-1600. In 1902 it became part of Nigeria, which was then under British rule. The region is largely contained in Nigeria’s present-day state of Borno.

Borobudur N.bo-ro-bii-'durV Buddhist monument in central Java, built c. 778-850 under the Shailendra dynasty. Constructed with about 2 million cu ft (57,000 cu m) of gray volcanic stone, it resembles a stepped pyramid. Its base and first five terraces are square; the highest three terraces are circular. Reliefs on its terrace walls represent the ascending stages of enlightenment. The simple and spacious upper circular terraces carry 72 bell-shaped stupas, each containing a statue of the Buddha.

Borodin \,b6r-9-'den\, Aleksandr (Porfiryevich) (b. Nov. 12, 1833, St. Petersburg, Russia — d. Feb. 27, 1887, St. Petersburg) Russian composer. From 1 862 he took lessons from Mily Balakirev; fired by nationalist sentiment, the two men became the core of the group of Russian composers known as The Five. A professor of chemistry for much of his life, he left a small compositional output, which includes the orchestral suite In the Steppes of Central Asia (1880), two string quartets, and three symphonies, the second of which has remained highly popular. His opera Prince Igor — which contains the often-heard “Polovtsian Dances” — was left unfinished after 18 years of intermittent work.

Borodin \b9-r9-'dyen,\ English X.bor-o-'denX, Mikhail (Markovich) orig. Mikhail Gruzenberg (b. July 9, 1884, Yanovichi, Russia — d. May 29, 1951, Siberia) Russian diplomat. He joined the Bolshevik faction in 1903, was arrested (1906), and lived in exile in the U.S. He returned to Russia in 1917 and in 1923 was sent to China as an adviser to Sun Yat-sen. There he built the loosely structured Nationalist Party (Guomindang) into a highly centralized Leninist-style organization and helped the Chinese Nationalists develop their army. After leaving China (1927), he served as deputy director of the Tass news agency and editor of the Moscow Daily News (1932 — 49). He was arrested in a Stalinist purge of Jewish intellectuals and died in a Siberian labour camp.

Borodino, Battle of (Sept. 7, 1812) Bloody battle of the Napoleonic Wars, fought during Napoleon’s invasion of Russia, near the town of Borodino, about 70 miles (110 km) west of Moscow. Napoleon’s 130,000

Borobudur, Java, Indonesia.

ROBERT HARDING PICTURE UBRARY/PHOTOBANK BKK

troops won a narrow victory over 120,000 Russians under Mikhail Kutuzov. The Russians suffered about 45,000 dead and wounded, while the French lost about 30,000 men. The victory allowed Napoleon to occupy Moscow.

boron Semimetallic chemical element, chemical symbol B, atomic number 5. Pure crystalline boron is a black, lustrous, very hard but brittle semiconductor that does not occur naturally. Boron compounds are found widely dispersed as various minerals, including borax and the gemstone tourmaline. The element is used to harden certain steels, among other metallurgical uses, and is also used in semiconductor devices. Its borate compounds, in which it has valence 3, are essential to plant growth and have many uses in soaps, mild antiseptics, and eye ointments. Industrially, they are used as herbicides, fire retardants in fabrics, and catalysts in numerous organic chemical reactions. They are also used in electroplating and glass and ceramic formulations. The exceptional hardness and inertness of certain boron compounds, including boron carbide, aluminum boride, and boron nitride (which has an electronic structure resembling that of diamond), make them useful as abrasives and reinforcing agents, particularly for high- temperature applications.

Borromeo \ 1 b6r-ro- , ma-o\ / Saint Charles (b. Oct. 1538, Arona, duchy of Milan — d. Nov. 3, 1584, Milan; canonized 1610; feast day November 4) Archbishop of Milan and leading figure in the Counter-Reformation. He earned a doctorate in canon and civil law at the University of Pavia in 1559. His uncle, Pope Pius IV, appointed him cardinal and archbishop of Milan in 1560. He was active in directing the Council of Trent, and he later helped execute its decrees and draw up the Roman catechism in 1566. He established seminaries and colleges in Milan and nearby cities and gained renown for his heroic behaviour during the plague of 1576-78.

Borromini, Francesco orig. Francesco Castelli (b. Sept. 25, 1599, Bissone, Duchy of Lombardy — d. Aug. 2, 1667, Rome)

Italian Baroque architect. Though he worked with Gian Lorenzo Bernini on the design of the famous baldachin in St. Peter's Basilica, the two later became bitter rivals. Borromini’s first independent commission was the Roman church and monastery of San Carlo alle Quattro Fontane (1638-41), the dome of which appears to float because its spring points (see arch) and light sources are concealed below. His works, composed of flowing concave and convex forms, contain spaces that are irregular ovals and polygons, as at Sant’Ivo della Sapienza (1642-60). His fortunes declined in later years, and in 1667 he committed suicide. His influence was felt in northern Italy and central Europe in the next century.

Borsippa \bor-'si-p3\ Ancient city, Babylonia. Located southwest of Babylon (near modern Al-Hillah, Iraq), its proximity to that capital helped it become an important religious centre. Hammurabi built or rebuilt the temple at Borsippa, dedicating it to the deity Marduk. During the reign of Nebuchadrezzar II, the city reached its greatest prosperity. Borsippa was destroyed by Xerxes I in the early 5th century bc and never fully recovered.

Interior of the dome of the church of S. Ivo della Sapienza, Rome, by Francesco Borromini, 1 642-60.

GEKS

borzoi Vbor-.zoiX Breed of hound developed in Russia. It is descended from the Arabian greyhound and a collielike Russian sheepdog. Formerly known as the Russian wolfhound, it was originally bred to hunt wolves and hares. It is graceful, strong, and swift, attaining a height of about 26-31 in. (66-79 cm) and a weight of 55-105 lbs (25^48 kg). It has a long, narrow head; small ears; a deep but narrow chest; long, muscular hindquarters; and a long, curved tail. Its silky coat is flat or slightly curled and usually is white with darker markings. It is noted for its elegant appearance.

Borzoi

SALLY ANNE THOMPSON/EB INC.

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Bosanquet Vbo-zsn-.ketA, Bernard (b. June 14, 1848, Alnwick, Northumberland, Eng. — d. Feb. 8, 1923, London) British philosopher. He helped revive in Britain the absolute idealism of G.W.F. Hegel and sought

to apply its principles to social and political problems. His debt to Hegel is most evident in his works on ethics, aesthetics, and metaphysics. His Some Suggestions in Ethics (1918) presents a view of reality as a synthesis in which traditional oppositions such as pleasure/duty and egoism/altruism are reconciled. His other works include Knowledge and Reality (1885), Logic (1888), and History of Aesthetic (1892). His idealism was attacked by G.E. Moore and Bertrand Russell.

Bosch \'bosh\, Hieronymus orig. Jeroen van Aken or Jerome van Aken (b. c. 1450s, ’s Hertogenbosch, Brabant — d. Aug. 9, 1516, ’s Hertogenbosch) Netherlandish painter. He was the son and grandson of accomplished painters; his name comes from his native town of ’s Hertogenbosch. He enjoyed a successful career and was widely imitated. Of the numerous works attributed to him, none can be dated precisely. His paintings blend fantasy and reality in apocalyptic scenes of chaos with half-human, half-animal creatures, devils, and demons interacting with human figures in imaginary architecture and landscapes. Among his best-known works is The Garden of Earthly Delights, depicting the dreams that afflict people who live in a pleasure-seeking world. One of the most original northern European artists of the late Middle Ages, he was an outstanding draftsman and one of the first to make drawings as independent works. He also produced decorative works, altarpieces, and stained-glass designs.

Bosch (Gavino) \'b6sh\, Juan (b. June 30, 1909, La Vega, Dom. Rep. — d. Nov. 1, 2001, Santo Domingo) Scholar, poet, and president of the Dominican Republic (1963). Bosch was raised in a lower-middle-class family. Dismayed by the brutality of the dictator Rafael Trujillo, he spent 24 years in exile but returned after Trujillo’s death to build a leftist anti-communist movement. After winning the first free presidential election in 38 years, he instituted liberal constitutional changes, many of which benefited the country’s poor. His reforms, however, alienated landholders and industrialists, and after only seven months in office Bosch was ousted in a military coup. When his supporters revolted against the ruling junta in 1965, U.S. Pres. Lyndon B. Johnson, claiming that Bosch’s followers were communists, sent troops to suppress the rebellion. Over the subsequent three decades, Bosch ran repeatedly but unsuccessfully for president.

Bose Vbos\, Subhas Chandra (b. Jan. 23, 1897, Cuttack, Orissa, India — d. Aug. 18, 1945, Taipei, Taiwan?) Indian revolutionary. Preparing in Britain for a career in the Indian civil service, he resigned his candidacy on hearing of nationalist turmoil back home. Sent by Mohandas K. Gandhi to organize in Bengal, he was deported and imprisoned several times. He favoured industrialization, which put him at odds with Gandhi’s economic thought, and though he was elected president of the Indian National Congress in 1938 and 1939, without Gandhi’s support he felt bound to resign. He slipped out of India in 1941 and carried on his struggle against the British from Nazi Germany and later from Southeast Asia. In 1944 he invaded India from Burma (Myanmar) with a small army of Indian nationals and Japanese, but his army was soon forced to retreat. He fled Southeast Asia after the Japanese surrender in 1945 and died of bums suffered in a plane crash.

Bose-Einstein statistics One of two possible ways (the other is Fermi-Dirac statistics) in which a collection of indistinguishable particles may occupy a set of available discrete energy states. The gathering of particles in the same state, which is characteristic of particles that obey Bose-

Einstein statistics, accounts for the cohesive streaming of laser light and the frictionless creeping of superfluid helium (see superfluidity). The theory of this behaviour was developed in 1924-25 by Satyendra Nath Bose (1894-1974) and Albert Einstein. Bose-Einstein statistics apply only to those particles, called bosons, which have integer values of spin and so do not obey the Pauli exclusion principle.

Bosna Vbos-na\ River River, Bosnia and Herzegovina. Rising at the foot of Mount Igman, it flows northward 168 mi (271 km) before entering the Sava River. Major cities along the Bosna include Zenica and Doboj.

Bosnia and Herzegovina \ , baz-ne-o... 1 her-ts9-go- , ve-no\ Country, Balkan Peninsula, southeastern Europe. It is bounded by Serbia and Montenegro and by Croatia. Area: 19,772 sq mi (51,209 sq km). Population (2005 est.): 3,853,000. Capital: Sarajevo. Major ethnic groups include Bosniacs (Bosnian Muslims; about two-fifths of the population), Serbs

(about one-third), and Croats (about one-fifth). Languages: Bosnian, Serbian, l ^ ■ 1 t bj 0 1111 Croatian (all official) . Religions : Christian-

ity (mostly Eastern Orthodox; also Roman

Catholic), Islam. Currency: marka. The country’s relief is largely mountainous, and elevations of more than 6,000 ft (1,800 m) are common. The land, drained by the Sava, Drina, and Neretva rivers and their tributaries, drops abruptly southward toward the Adriatic Sea. Agriculture is a mainstay of the economy; though the area possesses a variety of minerals, it remains one of the poorest regions of the former Yugoslavia. Bosnia and Herzegovina is a republic with two legislative houses; its chief of state is the chairman of the tripartite presidency, and the head of government is the chairman of the Council of Ministers. Habitation long predates the era of Roman rule, during which much of the country was included in the province of Dalmatia. Slav settlement began in the 6th century ad. For the next several centuries, parts of the region fell under the rule of Serbs, Croats, Hungarians, Venetians, and Byzantines. The Ottoman Turks invaded Bosnia in the 14th century, and after many battles it became a Turkish province in 1463. Herzegovina, then known as Hum, was taken in 1482. In the 16th and 17th centuries the area was an important Turkish outpost, constantly at war with the Habsburgs and Venice. During this period much of the population converted to Islam. At the Congress of Berlin after the Russo-Turkish War of 1 877-78, Bosnia and Herzegovina were assigned to Austria-Hungary, and they were annexed in 1908. Growing Serbian nationalism resulted in the 1914 assassination of the Austrian archduke Francis Ferdinand at Sarajevo by a Bosnian Serb, an event that precipitated World War I. After the war the area became part of the Kingdom of Serbs, Croats, and Slovenes. Following World War II, the twin territories became a republic of communist Yugoslavia. With the collapse of communist regimes in eastern Europe, Bosnia and Herzegovina declared its independence in 1992; its Serbian population objected, and conflict ensued among Serbs, Croats, and Muslims (see Bosnian conflict). A peace accord in 1995 established a loosely federated government roughly divided between the Muslim-Croat Federation of Bosnia and Herzegovina and the Serb Republic. In 1996 a NATO peacekeeping force was installed there.

Bosnian conflict (1992-98) Ethnically rooted war in Bosnia and Herze-

govina, a republic of Yugoslavia with a multiethnic population — 44% Bosniac (formerly known as Muslim), 33% Serb, and 17% Croat. Unrest began with Yugoslavia's breakup in 1990; after a 1992 referendum, the European Community (now European Union) recognized Bosnia's independence. Bosnia's Serbs responded violently, seized 70% of Bosnian territory, besieged Sarajevo, and terrorized Bosniacs and Croats in what came to be known as "ethnic cleansing." After bitter fighting between the Bosnian Croats and the Bosnian government, international pressure forced

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the two factions to sign a cease-fire and an agreement for a federation. Both then concentrated on their common enemy, the Serbs. After rejected peace plans and continued warring, Western nations, with NATO backing, imposed a final cease-fire negotiated at Dayton, Ohio, in 1995. Bosnia and Herzegovina became a single state composed of two distinct entities. Today Bosnia and Herzegovina has three de facto monoethnic entities, three separate armies and police forces, and a very weak national government. See also Radovan Karadzic, Franjo Tudjman.

Bosnian crisis (1908) International crisis caused by Austria-Hungary's annexation of the Balkan provinces of Bosnia and Herzegovina. Russia supported Serbia, which protested the annexation and demanded that Austria cede part of the territory to Serbia, but Austria-Hungary, supported by Germany, threatened to invade Serbia if it persisted in its demands. Since Russia could not risk war against both Germany and Austria-Hungary, it was forced to accept the annexation. Though the crisis was resolved without immediate warfare, it contributed to the outbreak of World War I.

boson \'bo-,zan\ Subatomic particle with integral spin that is governed by Bose-Einstein statistics. Bosons include mesons, nuclei of even mass number, and the particles required to embody the fields of quantum field theory. Unlike fermions, there is no limit to the number of bosons that can occupy the same quantum state, a behaviour that gives rise to the superfluidity of helium-4.

Bosporus Vbas-po-rosX Turkish Karadeniz Bogazi

X.ka-ra-de-'nez-.bo-a-'ziX Strait separating European Turkey from Asian Turkey. Connecting the Sea of Marmara with the Black Sea, it is 19 mi (31 km) long and 2.8 mi (4.4 km) at its widest. Bosporus literally means "ox ford"; it is traditionally connected with the legendary figure of Io, who in the form of a heifer crossed the Thracian Bosporus in her wanderings. Because of its strategic importance for the defense of Constantinople (modern Istanbul), which straddled its southern end, the Byzantine emperors and later the Ottoman sultans constructed fortifications along its shores. With the growing influence of the European powers in the 19th century, rules were codified governing the transit of vessels through the strait. An international commission assumed control of it after World War I; Turkey resumed control in 1936. Two of the world's longest bridges,

completed in 1973 and 1988, span the strait.

Bosporus, Kingdom of the or Cimmerian Bosporus Ancient Greek kingdom, in modern southern Ukraine. It was first settled by Milesians (6th century bc) at Panticapaeum, which later became the capital. Gradually the kingdom grew to include all of the Crimea. It maintained close ties with Athens in the 5th-3rd century bc, reaching the peak of its power in the 4th century bc. It came under the rule of the kings of Pontus after 110 bc. For 300 years it belonged to the Roman Empire, and after ad 342 it was alternately under barbarian and Byzantine control.

Bosra See Bostra

Bossuet \bo-'swa\, Jacques-Benigne (b. Sept. 25, 1627, Dijon, France — d. April 12, 1704, Paris) French bishop. Ordained a priest in 1652, he gained a reputation as a great orator and popular preacher. In 1681 he became bishop of Meaux. He was the most eloquent and influential spokesman for the rights of the French church against papal authority in the 17th century. He is now chiefly remembered for his literary works, including funeral panegyrics.

Boston Seaport city (pop., 2000: 589,141), capital of Massachusetts, U.S. Located on Massachusetts Bay, an arm of the Atlantic Ocean, it is the state's largest city. Settled in 1630 by Puritan Englishmen of the Massachusetts Bay Company, Boston became the hub of the self-governing Massachusetts Bay Colony under the leadership of Gov. John Winthrop. At the forefront of the opposition to British trade restrictions on its American colonies, Boston was a locus of events leading to the American Revolution: it was the scene of the Boston Massacre (1770) and Boston Tea Party (1773). It was the centre for the antislavery movement (1830-65). As the Industrial Revolution took hold in the U.S., Boston grew as an important manufacturing and textile centre. Today financial and high-technology industries are basic to the economy of the Boston area. Numerous institutions of higher education are located there, including Boston University. See also Cambridge.

Boston Globe, The Daily newspaper published in Boston, one of the more influential newspapers in the U.S. Founded in 1872, it was purchased in 1877 by Charles H. Taylor. Under his leadership, it began publishing morning and evening editions, increased local and regional

coverage, and introduced big headlines, especially on sensational stories. In the 20th century, still headed by the Taylor family, the paper began providing more national and international news while maintaining a generally liberal editorial stance. The New York Times Co. acquired the Globe in 1993.

Boston Massacre Skirmish on March 5, 1770, between British troops and a crowd in Boston. After provocation by the colonists, British soldiers fired on the mob and killed five men, including Crispus Attucks. The incident was widely publicized by Samuel Adams, Paul Revere, and others as a battle for American liberty, and it contributed to the unpopularity of the British in the years before the American Revolution.

Boston Police Strike Strike in 1919 by most of Boston's police force to protest the police commissioner's decision to deny them the right to unionize. The mayor called in the city militia to restore order and break

the strike; Gov. Calvin Coolidge later sent in the state militia, which gave him a reputation as a strong supporter of law and order and led to his nomination as vice president on the 1920 Republican ticket.

Boston Strangler American serial killer who murdered at least 1 1 and as many as 13 women in the Boston area between 1962 and 1964. The killer's first victim, a 55-year-old woman, was sexually assaulted and strangled in her apartment on June 14, 1962. During the following months, several other elderly women were murdered in similar circumstances, though subsequent victims included young women. In 1965 Albert DeSalvo, an inmate at a state mental hospital, confessed to the murders. Although never charged with the killings because no physical evidence tied him to the murder scenes, he was convicted on separate counts of sexual assault and sentenced to life imprisonment. DeSalvo' s guilt remains controversial, in part because his confessions demonstrated ignorance of many aspects of the crimes. DNA tests in 2001 confirmed that it was all but impossible that DeSalvo was guilty of the last of the murders, though it was one of the crimes to which he had confessed.

Boston Tea Party Incident on Dec. 16, 1773, in which American patriots dressed as Indians threw 342 chests of tea from three British ships into Boston Harbour. Their leader was Samuel Adams. The action was taken to prevent the payment of a British-imposed tax on tea and to protest the British monopoly of the colonial tea trade authorized by the Tea Act. In retaliation, Parliament passed the punitive Intolerable Acts, which further united the colonies in their opposition to the British.

Boston terrier Breed of dog developed in the late 19th century in Boston. Bred from the English bulldog and a white English terrier, the Boston terrier is one of the few breeds to have originated in the U.S. It has a terrier-like build, dark eyes, a short muzzle, and a short, fine coat of black or brindle, with white on the face, chest, neck, and legs. It stands 14-17 in. (36 — 43 cm) high and ranges in weight from 15 to 25 lbs (7-11 kg). The breed is characteristically gentle and affectionate.

Bostra modern Busra Vbus-re\ al-Sham Ruined city, southwestern Syria. Lying south of Damascus, it was first a Nabataean city and was later conquered by the Romans (see Roman Republic and Empire) under Trajan. It was the capital of the Roman province of Arabia and served as a fortress east of the Jordan River. It became the see of a bishop early in the 4th century ad but fell to the Muslims in the 7th century. Crusaders captured the city in the 12th century but failed to hold it, and it quickly fell into decline. It is the site of monumental remains of temples, triumphal arches, aqueducts, churches, and mosques.

Boswell, James (b. Oct. 29,

1740, Edinburgh, Scot. — d. May 19,

1795, London, Eng.) Scottish friend and biographer of Samuel Johnson.

Boswell, a lawyer, met Johnson in 1763 and visited him often (1772–84), making a superlatively detailed record in his journals of Johnson's conversations. His two-volume Life of Samuel Johnson, LL.D. (1791) is

Boswell, detail of an oil painting from the studio of Sir Joshua Reynolds, 1 786; in the National Portrait Gallery, London

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regarded as one of the greatest English biographies. His Journal of a Tour to the Hebrides (1785) is mainly an account of Johnson's responses to their 1773 trip to Scotland. The 20th-century publication of Boswell's journals showed him to have been also one of the world's greatest diarists.

Bosworth Field, Battle of (Aug. 22, 1485) Final battle in the English Wars of the Roses. It was fought between the forces of King Richard III of York and the contender for the crown, Henry Tudor (later Henry VII) of Lancaster. The battle occurred when Henry returned from exile, landing with an army at Milford Haven and meeting Richard's forces 12 mi (19 km) west of Leicester. The king's men were defeated and put to flight, and Richard was unhorsed and killed in a bog (a scene depicted in William Shakespeare's Richard III). The battle established the Tudor dynasty on the English throne.

botanical garden or botanic garden Originally, a collection of living plants designed to illustrate relationships within plant groups. Most modern botanical gardens are concerned primarily with exhibiting ornamental plants in a scheme that emphasizes natural relationships. A display garden of mostly woody plants (shrubs and trees) is often called an arboretum. The botanical garden as an institution can be traced to ancient China and many Mediterranean countries, where such gardens were often centers for raising plants used for food and medicines. Botanical gardens are also reservoirs of valuable heritable characteristics, potentially important in the breeding of new varieties of plants. Still another function is the training of gardeners. The world's most famous botanical garden is Kew Gardens.

botany Branch of biology that deals with plants, including the study of the structure, properties, and biochemical processes of all forms of plant life, as well as plant classification, plant diseases, and the interactions of plants with their physical environment. The science of botany traces back to the ancient Greco-Roman world but received its modem impetus in Europe in the 16th century, mainly through the work of physicians and herbalists, who began to observe plants seriously to identify those useful in medicine. Today the principal branches of botanical study are morphology, physiology, ecology, and systematics (the identification and ranking of all plants). Subdisciplines include bryology (the study of mosses and liverworts), pteridology (the study of ferns and their relatives), paleobotany (the study of fossil plants), and palynology (the study of modern and fossil pollen and spores). See also forestry, horticulture.

Botany Bay Inlet of the South Pacific Ocean, southeastern Australia. Lying south of Sydney off Port Jackson, it is about 6 mi (10 km) at its widest. It was the scene of the first Australian landing by Capt. James Cook in 1770; he named the bay for its great variety of plants. It was selected in 1787 as the site for a penal settlement, but the settlement was soon transferred inland. Its shores are now ringed by Sydney’s suburbs.

Botero, Fernando (b. April 19, 1932, Medellin, Colom.) Colombian painter and sculptor. He began painting as a teenager. By the time he moved to New York City in 1960, he had developed his trademark style: the depiction of round, corpulent humans and animals. In these works, his use of flat, bright colour and boldly outlined forms reflected the influence of Latin American folk art, while his strong compositions often emulated the Old Masters. In 1973 Botero moved to Paris and began creating sculptures that again focused on rotund subjects. Successful outdoor exhibitions of his monumental bronze figures were staged around the world at the end of the 20th century.

botfly Any member of several dipteran families with beelike adults and larvae that are parasitic on mammals. Some species are serious pests of horses, cattle, deer, sheep, rabbits, and squirrels, and one species (the human botfly) attacks humans. Adults of several species lay many eggs (nits) on the host’s body, and the emerging larvae penetrate its skin. The larvae reemerge through the skin, then mature into egg-laying adults. In the New World tropics, the botfly’s infestation of cattle has led to loss of beef and hides. See also warble fly.

Botha Vbo-toV Louis (b. Sept. 27, 1862, near Greytown, Natal [South Africa] — d. Aug. 27, 1919, Pretoria, Transvaal) First prime minister (1910-19) of the Union of South Africa. Botha was elected to the South African Republic’s parliament in 1897, where he sided with moderates against Pres. Paul Kruger’s hostile policy toward Uitlanders (non-Boer, mostly English, settlers). In the South African War he commanded southern forces besieging Ladysmith and then tried unsuccessfully to defend

the Transvaal. As prime minister he sought earnestly to appease the English-speaking population and was bitterly attacked by Afrikaner nationalists. In World War I he acceded to British requests to conquer German South West Africa (Namibia).

Botha, P(ieter) W(illem) (b. Jan. 12, 1916, Paul Roux, S.Af.) Prime minister (1978-84) and first state president (1984-89) of South Africa.

Elected to parliament as a National Party candidate in 1948, Botha served in several subsequent posts before replacing John Vorster as prime minister in 1978. His government faced serious difficulties, including the coming to power of black governments in Mozambique, Angola, and Zimbabwe, an insurgency in South West Africa (Namibia), and domestic unrest among black students and labour unions. Botha responded by backing antigovernment troops in the bordering states and suppressing rebellion at home. A target of criticism from within and outside his party, he fell ill and resigned in 1989.

Bothnia, Gulf of Northern arm of the Baltic Sea. Extending between Sweden and Finland, it covers about 45,200 sq mi (117,000 sq km). It is 450 mi (725 km) long and 50-150 mi (80-240 km) wide, with an average depth of 200 ft (60 m). Because many rivers drain into it, its salinity is very low; annual ice cover consequently lasts up to five months.

Botox Trademark for botulinum toxin type A, a drug produced by the bacterium Clostridium botulinum. It contains the same toxin that causes severe food poisoning (botulism). When locally injected, Botox blocks the release of the neurotransmitter acetylcholine, interfering with the ability of the muscle to contract. It is used to treat severe muscle spasm or severe, uncontrollable sweating. Botox can also be used for cosmetic purposes to treat facial wrinkles.

Botswana officially Republic of Botswana formerly Bechuanaland V.bech-'wa-ns-.landX Country, southern Africa. Area: 224,848 sq mi (582,356 sq km). Population (2005 est.): 1,765,000. Capital: Gabor-

ethnic Tswana; other main groups include

the Khalagari, Ngwato, Tswapong, Birwa, * — * — — ^ 60mi

and Kalanga. There are also small groups

of Khoekhoe and San, some of whom follow a traditional nomadic way of life. Languages: English (official), Tswana. Religions: Christianity (mostly independent and unaffiliated Christians; also Protestant), traditional beliefs. Currency: pula. Botswana is essentially a sand-filled basin, with a mean elevation of about 3,300 ft (1,000 m). Part of the Kalahari Desert is in the southwest and west, while the Okavango Swamp is in the north. The only sources of permanent surface water are the Chobe River, which marks the Namibian boundary; the Okavango River, in the far northwest; and the Limpopo River, which marks

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the South African boundary in the southeast. The economy traditionally depends on livestock raising; the development of diamond mining has

increased the country’s wealth. Botswana is a republic with one legislative body; its head of state and government is the president. The region’s earliest inhabitants were the Khoekhoe and San. Sites were settled as early as ad 190 during the southerly migration of Bantu-speaking farmers. Tswana dynasties, which developed in the western Transvaal in the 13th–14th centuries, moved into Botswana in the 18th century and established several powerful states. European missionaries arrived in the early 19th century, but it was the discovery of gold in 1867 that excited European interest. In 1885 the area became the British Bechuanaland Protectorate, remaining so until the 1960s. In 1966 the Republic of Bechuanaland was proclaimed as an independent member of the British Commonwealth, and later that year its name was changed to Botswana. Independent Botswana tried to maintain a delicate balance between its economic dependence on South Africa and its relations with the surrounding black countries; the independence of Namibia in 1990 and South Africa’s rejection of apartheid eased tensions.

Botticelli X.bat-o-'chel-eV Sandro orig. Alessandro di Mariano Filipepi (b. 1445, Florence — d. May 17, 1510, Florence [Italy]) Italian Renaissance painter. As a youth he may have been apprenticed to a goldsmith, and he later trained with Fra Filippo Lippi in Florence. By 1470 he had developed a distinctive style and was established as a master. In 1481 he was among a team of Florentine and Umbrian artists called to Rome to decorate the Sistine Chapel; three of his finest religious frescoes (completed 1482) can be seen there. Though prolific as a painter of religious images, his mythological paintings are his best-known works. His outstanding portraits show the influence of contemporary Flemish art in the placement of the figure in front of a landscape. Among his greatest works are the Primavera, Pallas and the Centaur, Venus and Mars, and The Birth of Venus, all painted c. 1477-90. About 75 of his paintings survive, many of them in the Uffizi Gallery in Florence. Interest in his work revived in the 19th century, and today he is one of the most esteemed painters of the Italian Renaissance.

The Birth of Venus, oil on canvas by Sandro Botticelli, c. 1485; in the Uffizi, Florence.

ART MEDIA/HERITAGE-IMAGES

bottlenose dolphin or bottle-nosed dolphin Widely recognized species (Tursiops truncatus) of mammal belonging to the dolphin family, found worldwide in warm and temperate seas. Bottlenose dolphins reach an average length of 8-10 ft (2.5-3 m) and weight of 300-650 lb (135–300 kg). Males are generally larger than females. A familiar performer at marine shows, the species is characterized by a “built-in smile” formed by the curvature of its mouth. It has also become the subject of scientific studies because of its intelligence and its ability to communicate with its kind through sounds and ultrasonic pulses.

bottom water Lowermost layer of ocean water that can be distinguished by its characteristic low temperature, high density, and low oxygen content compared with surface waters. Most bottom waters are formed near Antarctica during the southern winter. The partial freezing of seawater over the Antarctic continental shelf produces salt-free ice and residual brine with a high density, which causes it to sink; it then flows northward along

the seafloor. The Arctic Ocean is less important as a source of bottom water

because it is isolated by barriers such as the Bering Sill and submarine ridges and banks between Greenland and the British Isles.

botulism Vba-cho-.li-zoirA Poisoning by botulinum toxin, one of the most potent toxins known, produced by Clostridium botulinum bacteria. It usually results from improperly sterilized canned (mostly home-canned) foods. Heat-resistant spores of these anaerobic bacteria in fresh food may survive canning. The bacteria multiply and secrete toxin, which remains potent if the food is not well heated before it is eaten. Botulism can also result from wound infection. Botulinum toxin blocks nerve-impulse transmission. If botulism is recognized in time, administered antitoxins can neutralize it. The first symptoms of botulism are nausea and vomiting, which usually appeal - six hours or less after the contaminated food is eaten. Fatigue, blurry vision, and general weakness follow. Respiratory paralysis can cause death if not treated with emergency tracheotomy and respiratory aid. Most victims recover completely if they survive paralysis. The bacteria’s intense toxicity makes it a potentially deadly biological warfare agent.

Bouake \bwa-'ka\ City (pop., 1995 est.: 330,000), central Cote d’Ivoire. It was established as a French military post in 1 899 on the road and railroad line from Abidjan to Burkina Faso (then Upper Volta). Bouake is among the nation’s largest cities and is the commercial and transportation hub of the interior.

Boucher \bu-'sha\, Francois (b. Sept. 29, 1703, Paris, Fr. — d. May 30, 1770, Paris) French painter, engraver, and designer. He was probably trained by his father, a minor painter. In 1723 he won the Prix de Rome, but he was unable to travel to Italy until 1728. For his first major commission he produced 125 engravings of drawings by Antoine Watteau. He executed important decorative commissions for Madame de Pompadour at Versailles. His playful style and frivolous subject matter exemplify the Rococo style and embody the elegant superficiality of French court life in the mid 18th century. He became a member of the Royal Academy in 1734, a principal designer for the royal porcelain factories, and director of the Gobelins tapestry factory. In 1765 he was appointed director of the Royal Academy and first painter to Louis XV. One of the great painters and draftsmen of the 18th century, he mastered every branch of decorative and illustrative painting.

Boucher Vbau-choiA, Jonathan (b. March 12, 1738, Cumberland, Eng. — d. April 27, 1804, Epsom, Surrey) English- American clergyman. He went to Virginia in 1759 as a private tutor. As rector of Annapolis, Md., he tutored George Washington’s stepson and became a family friend. His royalist views cost him his position and he was forced to return to England in 1775. In his retirement he wrote A View of the Causes and Consequences of the American Revolution (1779); his glossary of “archaic and provincial words” was later used for Noah Webster’s dictionary.

Boucicault \'bu-si-,ko\, Dion orig. Dionysius Lardner Boursiquot (b. Dec. 26, 1820/22, Dublin, Ire. — d. Sept. 18, 1890, New York, N.Y., U.S.) Irish-born U.S. playwright. He began acting in 1837 and wrote the successful comedy London Assurance (1841) and The Corsican Brothers (1852). In 1853 he moved to New York City, where he was instrumental in obtaining the first copyright law for drama in the U.S. His

successful play The Poor of New York (1857) was presented elsewhere — as, for example, The Poor of London. Concerned with social themes, he wrote a veiled attack on slavery in The Octoroon (1859). He also wrote a series of popular Irish plays, including The Colleen Bawn (1860) and The Shaughraun (1874).

Boudiaf \bu-'dyaf\, Mohamed (b. June 23, 1919, M'Sila, Alg. — d. June 29, 1992, Annaba) Algerian political leader. With Ahmed Ben Bella, he cofounded the Algerian National Liberation Front (FLN), which led the fight for Algerian independence from France (1954-62). He was imprisoned by the French from 1956 until Algerian independence in 1962, whereupon he became deputy premier under Ben Bella in the new government. His opposition to Ben Bella's autocratic style led to a 27-year exile. In 1992 he was invited back to head the government and to deal with rising religious influence in political affairs. He was assassinated by a bodyguard shortly thereafter. See also Islamic Salvation Front.

Boudicca \bu-'dik-9\ or Boadicea \ l bo-3d-9-'se-9\ (d. ad 60) Ancient British queen. When her husband, a Roman client king of the Iceni, died in ad 60, he left his estate to his daughters and the emperor Nero, hoping for protection. Instead the Romans annexed his kingdom and mistreated his family and tribesmen. Boudicca raised a rebellion in East Anglia, burning

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Camulodunum (Colchester), Verulamium (St. Albans), and part of Londinium (London) and military posts; according to Tacitus, her forces massacred up to 70,000 Romans and pro-Roman Britons and destroyed the Roman 9th Legion. She is thought to have taken poison or died of shock when the Roman governor rallied his troops and destroyed her huge army.

Boudin \bu-'da n \, Eugene (b. July 12, 1824, Honfleur, Fr. — d. Aug. 8, 1898, Deauville) French landscape painter. Encouraged at an early age by Jean- Francois Millet, Boudin became a strong advocate of painting directly from nature. In 1874 he exhibited with the Impressionists, but, unlike those painters, he was not an innovator, and from 1863 to 1897 he exhibited regularly in the official Salon. His favourite subjects were beach scenes and seascapes, which show remarkable sensitivity to effects of atmosphere; on the backs of his paintings he recorded the weather, light, and time of day. His works link the careful naturalism of the mid 19th century and the brilliant colours and fluid brushwork of Impressionism.

boudinage \,bud- 3 n-'azh\ Cylinder-like structures making up a layer of deformed rock. They commonly lie adjacent to each other and are joined by short necks, giving the appearance of a string of sausages (boudin is French for "sausage"). The necks may be filled with recrystallized minerals such as quartz, feldspar, or calcite. Boudinage occurs in a variety of rock types and is one of the more common structures found in folded rocks.

Boudinot\'bud- 3 n-6\, Elias (b. May 2, 1740, Philadelphia, Pa. — d. Oct. 24, 1821, Burlington, N.J., U.S.) U.S. public official. He became a lawyer in 1760. Though a conservative Whig, he supported the American Revolution. He was president of the Continental Congress in 1782-83 and later served in the U.S. House of Representatives (1789-95) and as director of the U.S. Mint at Philadelphia (1795-1805).

Bougainville Vbii-gon-.viA Island (pop., 2000: 175,160), Papua New Guinea. The largest of the Solomon Islands, near the northern end of that chain, it has a land area of about 3,600 sq mi (8,500 sq km). The Emperor Range, with its highest peak at Balbi (9,000 ft [2,743 m]), occupies the northern half of the island, while the Crown Prince Range occupies the southern half. It was visited by Louis-Antoine de Bougainville in 1768, and it came under German control in the late 19th century. After World War I it was included in an Australian mandate. Following World War II it was made part of the UN Trust Territory of New Guinea, and it passed to Papua New Guinea when that country became independent in 1975. A treaty signed in 2001 promised the island autonomy, which was attained in 2005.

Bougainville \bu-ga n -'vel\, Louis-Antoine de (b. Nov. 11, 1729, Paris, France — d. Aug. 3, 1811, Paris) French navigator. In 1764 he established a colony for France in the Falkland Islands. Commissioned by the government to circle the Earth in a voyage of exploration, he put to sea in 1766; after touching Samoa and the New Hebrides he continued west into waters not previously navigated by any European. He turned north on the fringes of the Great Barrier Reef and did not sight Australia. He stopped in the Moluccas and in Java before returning to Brittany in 1769. His widely read Voyage Round the World (1771) helped popularize a belief in the moral worth of people in their natural state. He was secretary to Louis XV (1772), led the French fleet in support of the American Revolution, and was named to the Legion of Honour by Napoleon. The plant genus Bougainvillea is named for him.

bougainvillea ^bii-gon-'vil-yo, .bii-gon-'ve-oX Any plant of the genus Bougainvillea, comprising about 14 species of shrubs, vines, or small trees (family Nyctaginaceae) native to South America and hardy in warm climates. Many species are spiny. Only the woody vines are widely popular; showy cultivated varieties of several species are often grown indoors. The inconspicuous flowers are surrounded by brightly coloured papery bracts, for which one species, B. glabra, is called paperflower. The bracts of various species range from purple to lemon-yellow.

Bouguereau \bu-g9-'ro\, William (-Adolphe) (b. Nov. 30, 1825, La Rochelle, Fr. — d. Aug. 19, 1905, La Rochelle) French painter. He entered the Ecole des Beaux-Arts in 1846 and was awarded the Prix de Rome in 1850. On his return from Italy in 1854, he became a successful proponent of academic painting and was instrumental in the exclusion of the radical Impressionists from the official Salon. Working in a smooth, highly finished style, he painted sentimental religious works, coyly erotic nudes, allegorical scenes, and realistic portraits. In 1876 he was elected to the Academy of Fine Arts. His influence was felt widely, particularly in the U.S.

Bouillaud \bu-'yo\, Jean-Baptiste (b. Sept. 16, 1796, Garat, Fr. — d. Oct. 29, 1881, Paris) French physician and researcher. He established the speech centre’s location in the brain and differentiated between speech

loss because of inability to create and remember word forms and inability to control speech movements. In cardiology, he established the connection between carditis and acute articular rheumatism. He helped explain normal heart sounds and described many abnormal ones, and he was the first to name and accurately describe the endocardial membrane and endocarditis. He published important books on heart diseases and on rheumatism and the heart.

Boukhara See Bukhara

Boukharouba, Mohammed ben Brahim See Houari Boumedi-

ENNE

Boulanger \bu-la n -'zha\, Georges (-Ernest-Jean-Marie) (b.

April 29, 1837, Rennes, France — d.

Sept. 30, 1891, Brussels, Belg.)

French general and politician. He entered the army in 1856, helped suppress the Paris Commune (1871), and rose in rank to brigadier general (1880) and director of infantry (1882). Named minister of war in 1886, he introduced various military reforms and was seen as the man destined to avenge France’s defeat in the Franco-Prussian War. In 1888 he led a short-lived but influential authoritarian movement that threatened to topple the Third Republic. In 1889 the government decided to prosecute him, prompting him to flee Paris. He was convicted in absentia for treason, and in 1891 he committed suicide.

Boulanger \bu-la n -'zha\, Nadia (-Juliette) (b. Sept. 16, 1887, Paris,

France — d. Oct. 22, 1979, Paris) French music teacher and conductor. Having studied composition with Charles-Marie Widor (1844-1937) and Gabriel Faur£, she stopped composing in her twenties (after the death of her sister, Lili, who was also a composer) and devoted the rest of her life to conducting, playing the organ, and teaching at the Ecole Normale (1920-39), Paris Conservatoire (from 1946), and especially the American Conservatory at Fontainebleau (from 1921). She became the most celebrated composition teacher of the 20th century; her many students included Aaron Copland, Roy Harris, Darius Milhaud, Virgil Thomson, Elliott Carter, Leonard Bernstein, and Philip Glass. Her sister, Lili Boulanger (1893-1918), wrote a remarkable amount of vocal and other music and was the first woman composer to win the Prix de Rome (1913).

Boulder City (pop., 2000: 94,673), north-central Colorado, U.S. Located at the base of the Rocky Mountains northwest of Denver, it was settled by miners in 1858 and grew with the arrival of two railroads in 1873. An extensive government-industrial-educational complex has

developed since the 1950s. It is the site of the University of Colorado.

Boulder Dam See Hoover Dam

boule \'bii-le\ Deliberative council in the city-states of ancient Greece. It existed in almost all constitutional city-states, especially from the late 6th century bc. In Athens the boule was created as an aristocratic body by Solon in 594 bc; later, under Cleisthenes, 500 members were elected to represent the 10 tribes (50 each). A certain number, in rough proportion to size, were allotted to each deme. Complementing the work of the ecclesia and Areopagus, the boule controlled finances, managed the fleet and cavalry, evaluated officials, received foreign ambassadors, and advised the strategus. The boule model largely influenced the organization of councils of other cities in the Hellenic period.

boules \'bulz\ French ball game, similar to bowls and boccie. Players take turns throwing or rolling a steel ball as close as possible to a small target ball; an opponent’s ball may be knocked away if necessary. The playing field is called a pitch.

boulevard Broad landscaped avenue that typically permits several lanes of vehicular traffic as well as pedestrian walkways. The earliest

Georges Boulanger

H. ROGER-VIOLLET

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boulevards originally followed the city walls (the word originally meant “bulwark”) and were built in the ancient Middle East, especially at Antioch. In Paris, straight and geometrically precise boulevards were incorporated into design principles taught at the Ecole des Beaux- Arts, and they form a prominent feature of the city. Similar boulevards are found in other cities such as Washington, D.C. Formal curving boulevards are a feature of such cities as Vienna and Prague.

Boulez \bu-lez\, Pierre (b. March 26, 1925, Montbrison, France) French composer and conductor. Originally a student of mathematics, he later studied with the composer and organist Olivier Messiaen at the Paris Conservatoire. Inspired by the works of Anton Webern, in the 1950s he began to experiment with total serialism; his serialist music is marked by a sensitivity to the nuances of instrumental texture and colour. In 1954 he founded a series of avant-garde concerts, the Domaine Musicale. His important works include Le Soleil des eaux (1948), Structures I and II (1952, 1961), Le Marteau sans maitre (1957), Pli selon pli (1962), and three piano sonatas. By the 1960s he had gained an international reputation not only as a composer but also as a conductor, particularly of the 20th-century repertoire. He was chief conductor of the BBC Symphony Orches-

tra (1971-74) and conductor of the New York Philharmonic (1971-78). In 1974 he founded the French national experimental studio IRC AM. With his greatly varied activities, including his often iconoclastic writings, he was the principal figure of the postwar international musical avant-garde.

Boulle Vbiil\, Andre-Charles or Andre-Charles Boule (b. Nov. 11, 1642, Paris, Fr. — d. Feb. 29, 1732, Paris) French cabinetmaker. After studying drawing, painting, and sculpture, he achieved fame as the most skillful furniture designer in Paris. In 1672 Louis XIV appointed him royal cabinetmaker at Versailles; his other patrons included Philip V of Spain and the duke of Bourbon. Boulle stretched the technique of marquetry to new heights, and his incorporation of elaborate brasswork and the inlaying of exotic woods (called boulle or buhl work, since his last name sometimes appeared as Buhl) was heavily imitated in the 1 8th— 19th centuries.

Boullee \bii-'la\, Etienne-Louis (b. Feb. 12, 1728, Paris, Fr. — d. Feb. 6, 1799, Paris) French architect, theorist, and teacher. He studied architecture and opened his own studio by age 19. Through his investigation of the properties of geometric forms, to which he attributed innate symbolic qualities, Boullee achieved a pure, modern Classicism. His greatest influence was as a teacher and theorist. In a series of theoretical plans for public monuments, culminating in the design (1784) for an immense sphere that would serve as a cenotaph honouring Isaac Newton, he gave imaginary form to his theories.

Boulogne, Jean See Giambologna

Boulsover Vbol-.zo-voA, Thomas (b. 1706, Elkington, Derbyshire, Eng. — d. September 1788, Sheffield) British inventor of fused plating (“old Sheffield plate"). As a craftsman of the Cutlers Co. in 1743, while repairing a copper-and-silver knife handle, he discovered that the two metals could be fused and that when the fused metals were rolled in a rolling mill they behaved like a single metal. His invention opened the way to economical production of a great variety of plated objects, from buttons and snuffboxes, which he himself made, to hollowware (e.g., tea sets) and utensils, which were soon manufactured in large quantity by other Sheffield workers.

Boulton \'bolt- 3 n\, Matthew (b. Sept. 3, 1728, Birmingham, Warwickshire, Eng. — d. Aug. 17, 1809, Birmingham) British manufacturer and engineer. With James Watt and William Murdock (1754-1839), he established the steam-engine industry by installing pumping engines to drain the Cornish tin mines. Foreseeing great industrial demand for steam power, he urged Watt to make various design improvements. Applying steam power to coining machinery, he made large quantities of coins for the British East India Co. and also supplied machinery to the Royal Mint. By 1 800, almost 500 steam engines had been installed in the British Isles and abroad.

Boumedienne \bu-mad-'yen\, Houari orig. Mohammed ben Brahim Boukharouba (b. Aug. 23, 1927, near Guelma, Alg. — d. Dec. 27, 1978, Algiers) Algerian political leader and president (1965-78). During Algeria’s fight for independence, he helped raise an Algerian army in the safety of Morocco and Tunisia. He deposed President Ahmed Ben Bella in 1965. His policies in the 1970s created tensions with Morocco and France, but he also negotiated important industrial contracts with Western nations and cultivated close relations with the Soviet bloc, becoming a leading figure in the nonaligned movement.

boundary layer In fluid mechanics, a thin layer of flowing gas or liquid in contact with a surface (e.g., of an airplane wing or the inside of a pipe). The fluid in the boundary layer is subjected to shear forces. A range of velocities is established across the boundary layer, from zero (provided the fluid is in contact with the surface) to maximum. Flow in boundary layers is more easily described mathematically than is flow in the free stream. Boundary layers are thinner at the leading edge of an aircraft wing and thicker toward the trailing edge; such boundary layers generally have laminar flow in the leading (upstream) portion and turbulent flow in the trailing (downstream) portion. See also drag.

Bounty, HMS British armed transport ship remembered for the mutiny of its crew on April 28, 1789. Commanded by Capt. William Bligh, it had sailed to Tahiti, taken on a cargo of breadfruit trees, and traveled as far as the Friendly Islands (Tonga) on the voyage to Jamaica when it was seized by the master’s mate, Fletcher Christian. The causes have been much debated; Bligh’ s opponents charged him with tyranny, while Bligh argued that the mutineers had become attached to Tahiti and its women. Bligh and 18 loyal crew members were set adrift in a longboat; after a voyage of more than two months and some 3,600 mi (5,800 km), they reached Timor. Christian and eight others took the Bounty to Pitcairn Island, where the small colony they founded remained undiscovered until 1808 and where their descendants still live. Of the mutineers who later went to Tahiti, three were taken to Britain and hanged.

bourbon See whiskey

Bourbon, Charles-Ferdinand de See due de Berry

Bourbon \bur-'bo n ,\ English Vbur-bonV, House of One of the most important ruling houses of Europe. Its members were descended from Louis I, due de Bourbon from 1327 to 1342, grandson of the French king Louis IX. Bourbons subsequently ruled in France (1589-1792, 1814-48); in Spain (1700-1868, 1870-73, 1874-1931, and since 1975); and in Naples and Sicily (1735-1861). Among its prominent members were Henry IV, Louis XIII, Louis XIV, Louis XV, Louis XVI, and Philip V.

Bourbon Restoration (1814-30) In France, the period that began when Napoleon abdicated and the Bourbon monarchs were restored to the throne. The First Restoration occurred when Napoleon fell from power and Louis XVIII became king. Louis’s reign was interrupted by Napoleon’s return to France (see Hundred Days), but Napoleon was forced to abdicate again, leading to the Second Restoration. The period was marked by a constitutional monarchy of moderate rule (1816-20), followed by a return of the ultras during the reign of Louis’s brother, Charles X (1824-30). Reactionary policies revived the opposition liberals and moderates and led to the July Revolution, Charles’s abdication, and the end of the Bourbon Restoration.

Bourbonnais V.biir-bo-'neV Historical region, central France. In Roman times it was part of Celtic Gaul under Julius Caesar and later part of Aquitania under Augustus. It gradually began a separate existence in the 10th century under a lord of Bourbon. It eventually passed to Louis, created duke de Bourbon in 1327, the ancestor of the Bourbon dynasty. Bourbonnais became part of the royal domain in 1527.

Bourdieu \bur-'dyce\, Pierre (b. Aug. 1, 1930, Denguin, France — d.

Jan. 23, 2002, Paris) French sociologist and public intellectual. Bourdieu introduced the concept of cultural capital, wealth based on social status and education, noting that success in school and society depends largely on the individual's ability to absorb the cultural ethos, or what he termed habitus, of the dominant class. Influenced by structuralism, he suggested that habitus is similar to yet more fundamental than a language. His works include The Algerians (1962), Outline of a Theory of Practice (1977), Distinction (1984), and Acts of Resistance: Against the Tyranny of the Market (1998).

Bourgeois Vbiir-'zhwaV Leon (-Victor-Auguste) (b. May 21, 1851, Paris, France — d. Sept. 29, 1925, Chateau d'Oger, near Epernay) French politician. He entered the civil service in 1876 and was elected to the National Assembly in 1888. He served in several ministerial posts and was briefly premier (1895-96). He was a member of the Senate in 1905-23 and its president from 1920. An advocate of international cooperation, he was appointed to the International Court of Justice in 1903. In 1919 he was France's representative to the League of Nations, emerging as its champion. For this, in 1920 he was awarded the Nobel Prize for Peace.

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Bourgeois Vbur-'zhwaV Louise (b. Dec. 25, 1911, Paris, Fr.) French-bom U.S. sculptor. She studied briefly with Fernand Leger and initially worked as a painter and engraver. In the late 1940s, after moving to New York City with her American husband, she turned to sculpture. She achieved recognition in the 1950s with wooden constructions painted uniformly black or white. She also worked in marble, plaster, latex, and glass. Though her works are abstract, they are suggestive of the human figure and express themes of betrayal, anxiety, and loneliness.

bourgeoisie X.burzh-.wa-'zeX In social and political theory, the social order dominated by the property-owning class. The term arose in medieval France, where it denoted the inhabitant of a walled town. The concept of the bourgeoisie is most closely associated with Karl Marx and those who were influenced by him. According to Marx, the bourgeoisie plays a heroic role in history by revolutionizing industry and modernizing society; however, it also seeks to monopolize the benefits of modernization and exploit the property-less proletariat, thereby creating revolutionary tensions. The end result will be a final revolution in which the property of the bourgeoisie is expropriated and class conflict, exploitation, and the state are abolished. Much employed by 19th-century social reformers, the term had nearly disappeared from the vocabulary of political writers and politicians by the mid 20th century. In popular speech, it connotes philistinism, materialism, and a striving concern for "respectability." See also social class.

Bourges, Pragmatic Sanction of See Pragmatic Sanction of Bourges

Bourguiba \bur-'ge-bo\, Habib (ibn Ali) (b. Aug. 3, 1903, Al-Munastlr, Tun. — d. April 6, 2000, Al-Munastlr) President of Tunisia (1957-87). He studied at the Sorbonne, where he met independence-minded Algerians and Moroccans. He founded a nationalist newspaper in 1932. In 1934 he founded the Neo-Destour Party and became central to the Tunisian liberation movement. His efforts led the French to imprison him for three years, but he negotiated Tunisia's independence from that country in 1956. The Tunisian monarchy was abolished in 1957, and Bourguiba became president. During his 30 years in office he kept the army small and devoted much of the budget to improving education and health. Made president for life in 1975, he was removed from in 1987 because of ill health. He was succeeded by Zine el-Abidine Ben All

Bourke-White \,b3rk-'hwlt\, Margaret (b. June 14, 1906, New York, N.Y., U.S. — d. Aug. 27, 1971, Stamford, Conn.) U.S. photographer. She began her professional career as an industrial and architectural photographer in 1927. She gained a reputation for originality and in 1929 was hired by Henry R. Luce for his magazine Fortune. She covered World War II for Life magazine as the first woman photographer to serve with the U.S. armed forces. Several collections of her photographs have been published, including You Have Seen Their Faces (1937), about sharecroppers of the American South.

Bournemouth \ 'bom-moth \ Seaside resort and unitary authority (pop., 2001: 163,441), Dorset, southern England, on the English Channel. It dates from 1810 but did not grow rapidly until after the coming of the railway in 1870. Predominantly a resort and residential town, it is one of England's main convention centres and is popular with retirees.

Bournonville Vbor-non-.ve-loV August (b. Aug. 21, 1805, Copenhagen, Den. — d. Nov. 30, 1879, Copenhagen) Danish dancer, choreographer, and director of the Royal Danish Ballet for almost 50 years. After studying and performing in Paris and Copenhagen, in 1830 he became director and choreographer of the Royal Danish Ballet, where he continued to dance until 1848. He established the Danish style, characterized by bravura dancing and expressive mime. Many of his ballets were based on observations he made while on tour; Napoli (1842), for example, was inspired by a trip to Italy.

Boutros-Ghali \'bu-tros-'ga-le\, Boutros (b. Nov. 14, 1922, Cairo, Egypt) Sixth secretary-general of the United Nations (1992-96), the first Arab and first African to hold the office. A descendant of a distinguished Egyptian Coptic family, he was educated at Cairo University and the University of Paris. After teaching at universities around the world, he joined Egypt's foreign ministry in 1977. As foreign minister, he accompanied Pres. Anwar el- Sadat to Jerusalem. He became Egypt's deputy prime minister in 1991 and was appointed UN secretary-general in 1992. During his single term he oversaw peacekeeping operations in Bosnia, Somalia, and Rwanda and led the UN in its 50th-anniversary celebration. In 1996 the U.S. blocked his bid for a second term.

Bouts \'bauts\, Dirck (b. c. 1415, Haarlem, Holland — d. May 6, 1475, Louvain, Brabant) Netherlandish painter. He was active in Louvain, where he was influenced by Rogier van der Weyden. His best-known works are a triptych altarpiece (1464) for the church of St. Peter in Louvain, its pan-

els representing the Last Supper and four Old Testament scenes, and two huge panels representing a scene of secular justice (1470-75) for the city hall, intended as examples of justice for the Louvain town council. His treatment of the human figure ranges from strong emotion expressed through symbolic gesture to great severity and restraint.

Bouvines Vbii-'venV, Battle of (July 27, 1214) Decisive victory won by the French king Philip II over an international coalition that included Emperor Otto IV, King John of England, and several powerful French vassals. Fought in the marshy plain between Bouvines and Toumai in Flanders, the battle was furiously contested but ended in a clear French victory. It confirmed Philip’s possession of French lands formerly held by the English and added to the power and prestige of the French monarchy. John’s defeat increased the opposition of his barons.

bouzouki \bu-'zii-ke\ Long-necked lute used in Greek popular music. Developed from a Turkish instrument early in the 20th century, it has a pear-shaped body and a fretted fingerboard. The modern instrument usually has four courses of strings, which are plucked with a plectrum, typically in a vigorous and agile style.

Boveri \bo-'va-re\, Theodor Heinrich (b. Oct. 12, 1862, Bamberg, Bavaria — d. Oct. 15, 1915, Wurzburg) German cell biologist. Working with roundworm eggs, Boveri proved that chromosomes are separate units within the nucleus of a cell. With Walter S. Sutton, he was the first to propose that genes were located on chromosomes. Boveri proved Edouard von Beneden’s theory that the ovum (egg) and sperm cell contribute equal numbers of chromosomes to the new cell created during fertilization. He later introduced the term centrosome and demonstrated that this structure is the division centre for a dividing egg cell.

bovid \'bo-vid\ Any ruminant of the family Bovidae. Bovids have hollow, unbranched, permanently attached horns; they are grazing or browsing animals found in both the Eastern and Western Hemispheres, most often in grasslands, scrublands, or deserts. Most species live in large herds. Species range in shoulder height from a 10-in. (25-cm) antelope to the 6.5-ft (2-m) bison. Some of the 138 species (including domestic cattle, sheep, goats) are of economic value to humans. Others (including bighorn and some antelope) are hunted for food, sport, horns, or hides. See also BUFFALO, ruminant.

Bow VboX, Clara (b. July 29, 1905, Brooklyn, N.Y., U.S. — d. Sept. 27, 1965, Los Angeles, Calif.) U.S. film actress. At age 16 she won a magazine contest that gave her a bit part in a film. Hired by Paramount Pictures in 1925, she played larger roles in silent films such as Mantrap (1926) and Kid Boots (1926). After her starring role as a flapper in the popular film It (1927), Bow became known as “the It girl,” with “It” being understood as the appeal of a liberated young woman. She starred in 20 more films (1927-30), but scandals and nervous breakdowns undermined her career.

bow and arrow Weapon consisting of a strip of wood or other flexible material, bent and held in tension by a string. The arrow, a long wooden shaft with a pointed tip, is stabilized in flight by a feathered tail. The arrow is fitted to the string by a notch in the end of the shaft and is drawn back to produce tension in the bow, which propels the arrow when the string is released. Bow construction ranges from wood, bone, and metal to plastic and fiberglass; arrowheads have been made from stone, bone, and metal. The origins of the bow and arrow are prehistoric. The bow was a primary military weapon from Egyptian times through the Middle Ages in the Mediterranean world and Europe and even longer in China and Japan. The Huns, Turks, Mongols, and other peoples of the Eurasian steppes excelled in warfare as mounted archers; horse archers were the most deadly weapon system of pre-gunpowder warfare. The crossbow, the compound bow, and the English longbow made the arrow a formidable battlefield missile. The powerful Turkish bow had a great impact on warfare in the late Middle Ages. In many cultures, the bow's importance in warfare has been secondary to its value as a hunting weapon. It is still sometimes used for recreational hunting. See also archery.

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Bow porcelain Vbo\ English soft-paste porcelain made at a factory in Stratford-le-Bow, Essex, c. 1744-76. From 1750 bone ash was used in its production by Thomas Frye, an Irish engraver, who invented the process. Bow varies in appearance and quality, but at its best has a soft, creamy-white tone with a smooth glaze. Bow tablewares were among the first English porcelain to be ornamented with transfer-printed decorations (see Battersea enamelware). Bow also produced great quantities of figurines (e.g., statesmen, actors, birds, animals) in the Rococo style.

Bow \'bo\ River River, Alberta, Canada. Rising in Banff National Park on the eastern slopes of the Rocky Mountains, it flows 315 mi (507 km) southeast through the park and east past Calgary to unite with the Oldman River and form the Saskatchewan River. It is important for hydroelectric power and irrigation. Bow Valley Provincial Park is 50 mi (80 km) west of Calgary.

Bowditch \'baud-ich\, Nathaniel (b. March 26, 1773, Salem, Mass., U.S. — d. March 16, 1838, Boston, Mass.) U.S. mathematician and astronomer. He was largely self-educated. After investigating the accuracy of J.H. Moore's The Practical Navigator, he produced a revised edition in 1799. In 1802 he published The New American Practical Navigator, adopted by the U.S. Department of the Navy, it was recognized as the best navigation text of its time. He translated and updated four volumes of Pierre-Simon Laplace's Celestial Mechanics (1829-39). He discovered the Bowditch curves (describing the motion of a pendulum), which have

important applications in astronomy and physics. He refused professorships at several universities and instead worked for insurance companies.

Bowdler, Thomas (b. July 11, 1754, Ashley, near Bath, Somerset, Eng. — d. Feb. 24, 1825, Rhydding, near Swansea, Glamorganshire, Wales) English physician, philanthropist, and man of letters. He is known for his Family Shakspeare (1818), in which, by expurgation and paraphrase, he aimed to provide an edition of the plays suitable for a father to read aloud to his family without fear of offending their susceptibilities or corrupting their minds. The first edition (1807) contained a selection of 20 plays that probably were expurgated by Bowdler' s sister, Harriet.

Bowdoin \'bo-d 3 n\ College Private liberal arts college in Brunswick, Maine. Founded in 1794 as a men's college, it was named for James Bowdoin (1726-90), first president of the American Academy of Aits and Sciences. It became coeducational in 1971. It offers bachelor's degrees in the arts, humanities, natural sciences, and social sciences. Academic facilities include a marine research station and an arctic museum. Its historic buildings include the Walker Art Building, designed by Charles F. McKim and Stanford White. Notable alumni include Nathaniel Hawthorne and U.S. Pres. Franklin Pierce.

bowel movement See defecation

Bowen \'bo-on\, Elizabeth (Dorothea Cole) (b. June 7, 1899, Dublin, Ire. — d. Feb. 22, 1973, London, Eng.) Irish-born British novelist and short-story writer. Among her novels are The House in Paris (1935), The Death of the Heart (1938), and The Heat of the Day (1949). Her short-story collections include The Demon Lover (1945). Her finely wrought prose style frequently details uneasy and unfulfilling relationships among the upper middle class. Her essays appear in Collected Impressions (1950) and Afterthought (1962).

Bowen, Norman L(evi) (b. June 21, 1887, Kingston, Ont., Can. — d. Sept. 11, 1956, Washington, D.C., U.S.) Canadian geologist. He worked on and off for more than 35 years for the Geophysical Laboratory in Washington, D.C., where he researched silicate systems. During World War I he made a brief foray into optics, but after the war he returned to his studies of silicate systems. In 1928 he published The Evolution of the Igneous Rocks, which had a profound influence on petrologic thought. At the University of Chicago (1937-47) he developed a school of experimental petrology. His achievements won him honours both in the U.S. and Europe.

bowerbird Vbau(-3)r-,b3rd\ Any of 17 bird species constituting the passerine family Ptilonorhynchidae, of Australia, New Guinea, and nearby islands. The male builds an elaborate structure (the bower) on the ground, decorates it with bright and shiny objects, and displays and sings loudly above it; females visit him and then lay their eggs in simple nests nearby. The mat, or platform, type of bower is a thick pad of plant material. The maypole type is a hut (sometimes as large as a child's playhouse) of twigs erected around one or more saplings in a cleared court. The avenue type consists of two close-set parallel walls of sticks on a circular mat of twigs. See also catbird.

Bowes, Edward known as Major Bowes (b. June 14, 1874, San Francisco, Calif., U.S. — d. June 14, 1946, Rumson, N.J.) U.S. radio per-

sonality. He promoted attendance at New York City's Capitol Theatre by starting a variety show, the Major Bowes Capitol Family, which became the radio program Original Amateur Hour (1935-46). The show (later revived for television as The Ted Mack Original Amateur Hour [1948–60]) gave aspiring singers and comedians, including Frank Sinatra and Bob Hope, a chance to perform before a national radio audience.

bowfin \'bo-,fin\ Voracious freshwater fish (Amia calva) that is the only living representative of the family Amiidae, which dates back to the Jurassic period (206-144 million years ago). It is found in sluggish North American waters from the Great Lakes southward to the Gulf of Mexico. Mottled green and brown, it has a long dorsal fin and strong conical teeth. The female, which is larger than the male, reaches a length of 30 in. (75 cm). The bowfin spawns in spring, when the male constructs a crude nest and guards both the fertilized eggs and the newly hatched young. It is sometimes called a dogfish.

Bowie \'bo-e\, David orig. David Robert Jones (b. Jan. 8, 1947, London, Eng.) British rock singer. In the mid-1960s Bowie sang in a number of bands in his native London. He changed his name in 1966 to avoid confusion with the lead singer of the Monkees. His first hit recording, "Space Oddity" (1969), and albums such as The Rise and Fall of Ziggy Stardust and the Spiders From Mars (1972) ushered in the glam rock trend, marked by theatricality and androgyny. His style varied widely, from the disco romanticism of Young Americans (1975) to the avant-garde austerities of Low (1977) to the mainstream pop of Let's Dance (1983). Bowie also acted in stage plays and in films such as The Man Who Fell to Earth (1976). He continued to record and perform into the 21st century.

Bowie \'bii-e\, Jim orig. James Bowie (b. 17967, Logan county, Ky., U.S. — d. March 6, 1836, San Antonio, Texas) U.S. soldier. Bowie migrated with his parents to Missouri (1800) and then to Louisiana (1802), where later he owned a sugar plantation and served in the state legislature. In 1828 he settled in Texas, assumed Mexican citizenship, acquired land grants, and married the vice-governor's daughter. In opposition to Mexican legislation to curb the immigration of U.S. settlers, he joined the Texas revolutionary movement and became a colonel in the Texas army. He is remembered for his gallant role in the defense of the Alamo. He invented the knife that bears his name. He became a legendary hero through Western song and ballad.

Bowles Yb6lz\, Chester (Bliss) (b. April 5, 1901, Springfield, Mass., U.S. — d. May 25, 1986, Sussex, Conn.) U.S. advertising executive and diplomat. A graduate of Yale University, he and William Benton established the Benton and Bowles advertising company (1929), which became one of the largest in the world. After selling his interest in 1941, Bowles served as director of the Federal Price Administration (1943 — 46). Elected governor of Connecticut in 1948, he was defeated in 1950 because of his liberal stand on civil rights. He was ambassador to India (1951-53), served in the U.S. House of Representatives (1953-61), and returned to India as ambassador (1963-69).

Bowles, Paul (Frederic) (b. Dec. 30, 1910, New York, N.Y., U.S. — d. Nov. 18, 1999, Tangier, Mor.) U.S. -Moroccan composer, writer, and translator. Bowles studied musical composition with Aaron Copland and wrote music for more than 30 plays and films. He moved to Morocco in the 1940s. He set his best-known novel, The Sheltering Sky (1948; film,

1990), in Tangier. His protagonists, in that novel and other works, are often Westerners maimed by their contact with traditional cultures that bewilder them, and violent events and psychological collapse are recounted in a detached and elegant style. His wife, Jane Bowles (1917–73), is known for the novel Two Serious Ladies (1943) and the play In the Summer House (1953).

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bowling Game in which a heavy ball is rolled down a long, narrow lane to knock down a group of 10 wooden objects (called pins). Versions of the game have existed since ancient times. Ninepin bowling was brought to the U.S. in the 17th century by Dutch settlers; it became so popular and so associated with gambling that it was outlawed in several states. The game grew to enormous popularity in the 20th century, both as a recreational activity and (since 1958) as a professional sport. If all the pins are knocked down with the first ball, a strike is recorded (10 points). If pins remain standing but the second ball knocks them down, the player is awarded a spare (10 points). If a strike is thrown in a frame (turn), the number of pins knocked down by the next two balls bowled count in that frame. After a spare, the score of the next ball counts in the spare's frame. Thus, the maximum point total for a single frame is 30. Each game is divided into 10 frames, and each player is allowed to deliver up to two balls per frame (except in the final frame, in which two additional deliveries are permitted following a strike [one additional following a spare]. A perfect score is 300, or 12 strikes in a row. Versions of the game include candlepins, duckpins, and skittles.

bowls or lawn bowls or lawn bowling Bowling game similar to the Italian boccie and the French boules played on a green with wooden balls (called bowls) that are rolled at a target ball (the jack). The object is to roll one's bowls so that they come to rest nearer to the jack than those of an opponent, sometimes achieved by knocking aside an opponent's bowl or jack. One point is awarded for each winning bowl. Depending on the game, players use four, three, or two bowls, and games end at 18 or 21 points.

Bowman Vbo-monV Sir William (b. July 20, 1816, Nantwich, Cheshire, Eng. — d. March 29, 1892, near Dorking, Surrey) English surgeon and histologist. His studies of organ tissues with his teacher Robert Todd led to major papers on the structure and function of voluntary muscle and of the kidneys and on the detailed anatomy of the liver. In the kidneys, he found that the capsule (Bowman capsule) surrounding each glomerulus (ball of capillaries) in the nephrons is a continuous part of the renal duct. This was of prime importance to his filtration theory of urine formation, key to understanding kidney function. Bowman and Todd published The Physiological Anatomy and Physiology of Man (2 vol., 1 845–56), a pioneering work in both physiology and histology. Turning to the eye, Bowman became one of the world's foremost ophthalmic research scientists, London's outstanding eye surgeon, and the first to describe

several eye structures and their functions.

box In botany, an evergreen shrub or small tree (genus Buxus) of the box family (Buxaceae), best known for the ornamental and useful boxwoods. The family comprises seven genera of trees, shrubs, and herbaceous plants, native to North America, Europe, North Africa, and Asia. The plants bear male and female flowers, without petals, on separate plants. The leathery, evergreen leaves are simple and alternate. Fruits are one- or two-seeded capsules or drupes. Three species of the genus Buxus provide the widely grown boxwood: the common, or English, box (B . sempervirens), used for hedges, borders, and topiary figures; the Japanese box (B . microphylla); and the tall boxwood tree (B. balearica).

box elder Hardy and fast-growing tree (Acer negundo), also called ash-leaved maple, of the maple family, native to the central and eastern U.S. Its compound leaves (rare among maples) consist of three, five, or seven coarsely toothed leaflets. The single seed is borne in a samara (dry, winged fruit). Because of its rapid growth and its drought resistance, it was widely planted for shade by early settlers in the prairie regions of the U.S. Maple syrup and sugar are sometimes obtained from the box elder. Its wood is used for crates, furniture, paper pulp, and charcoal.

box turtle Any of several species of terrestrial turtle (genus Terrapene) found in the U.S. and Mexico. Box turtles have a high, rounded upper shell (carapace) that grows to a maximum length of about 7 in. (18 cm). The lower shell (plastron) is hinged across the center and can be drawn very tightly against the carapace to form a protective “box” that completely encloses the turtle’s soft

parts. They feed on earthworms, Box turtle (Terrapene Carolina) insects, mushrooms, and berries, johnh. gerard- ebinc.

Box turtles are often kept as pets.

boxer Smooth-haired breed of working dog named for its manner of “boxing” with its sturdy front paws when beginning to fight. Developed in Germany, it includes strains of bulldog and terrier in its heritage.

Because of its reputation for courage, aggressiveness, and intelligence, it has been used in police work; it is also valued as a watchdog and companion. Trim and squarely built, it has a short, square muzzle; a black mask on its face; and a shiny, shorthaired coat of reddish brown or brindle. It stands 21-24 in. (53-61 cm) high and weighs 60-70 lbs (27-32 kg).

Boxer Rebellion Officially sup-

ported peasant uprising in 1900 in China that attempted to drive all foreigners from the country. “Boxer” was the English name given to a Chinese secret society that practiced boxing and calisthenic rituals in the belief that it would make its members impervious to bullets. Support for them grew in northern China during the late 19th century, when China’s people were suffering from growing economic impoverishment and the country was forced to grant humiliating concessions to Western powers. In June 1900, after Boxers had killed Chinese Christians and Westerners, an international relief force was dispatched to quell the attacks. The empress dowager, Cixi, ordered imperial forces to block its advance; the conflict escalated, hundereds of people were killed, and the matter was not resolved until August, when Beijing was captured and sacked. Hostilities were ended with a protocol (1901) requiring China to pay a large indemnity to 11 countries. Britain and the U.S. later returned much of their reparations, the U.S. using its portion to further Chinese higher education. See also U.S. Open Door policy.

boxing Sport involving attack and defense with the fists. In the modern sport, boxers wear padded gloves and fight bouts of up to 12 three-minute rounds in a roped-off square known as the ring. In ancient Greece fighters used leather thongs on their hands and forearms, while in Rome gladiators used metal-studded leather hand coverings (cesti) and usually fought to the death. Not until implementation of the London Prize Ring rules in 1 839 were kicking, gouging, butting, biting, and blows below the belt eliminated from the boxer’s standard repertoire. In 1867 the Queensberry rules called for the wearing of gloves, though bare-knuckle boxing continued into the late 1880s. The last of the great bare-knuckle fighters was John L. Sullivan. From Sullivan on, the U.S. became the premier boxing venue, partly because immigrants supplied a constantly renewed pool of boxers. Boxing has been included among the Olympic Games since 1904. Today there are 17 primary weight classes in professional boxing; straw weight, to 105 lbs (48 kg); junior flyweight, to 108 lbs (49 kg); flyweight, to 112 lbs (51 kg); junior bantamweight, to 115 lbs (52 kg); bantamweight, to 118 lbs (53.5 kg); junior featherweight, to 122 lbs (55 kg); featherweight, to 126 lbs (57 kg); junior lightweight, to 130 lbs (59 kg); lightweight, to 135 lbs (61 kg); junior welterweight, 140 lbs (63.5 kg); welterweight, to 147 lbs (67 kg); junior middleweight, 154 lbs (70 kg); middleweight, to 160 lbs (72.5 kg); super middleweight, 168 lbs (76 kg); light heavyweight, to 175 lbs (79 kg); cruiserweight, 190 lbs (86 kg); and heavyweight, over 190 lbs. A bout can be won either by knocking out or felling one’s opponent for a count of 10 (a KO) or by delivering the most solid blows and thus amassing the most points. The referee can also stop the fight when one boxer is being badly beaten (a technical knockout, or TKO) or he can disqualify a fighter for rules violations and award the fight to his opponent.

Boy Scouts See scouting

boyar \bo-'yar\ Any male member of the upper class of medieval Russian society and state administration. In Kievan Rus (10th- 12th centuries) the boyars belonged to the prince’s retinue, holding posts in the army and civil administration and advising the prince in matters of state through a boyar council, or duma. In the 13th- 14th centuries the boyars constituted a privileged class of rich landowners in northeastern Russia. In the 15th-17th centuries the boyars of Muscovy ruled the country along with the grand prince (later the czar) and legislated through the boyar council. Their importance declined in the 17th century, and the title was abolished by Peter I in the early 18th century.

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boycott Collective and organized ostracism applied in labour, economic, political, or social relations to protest and punish practices considered unfair. The tactic was popularized by Charles Stewart Parnell to protest high rents and land evictions in Ireland in 1880 by the estate manager Charles C. Boycott (b. 1832 — d. 1897). Boycotts are principally used by labour organizations to win improved wages and working conditions or by consumers to pressure companies to change their hiring, labour, environmental, or investment practices. U.S. law distinguishes between primary boycotts, which consist of the refusal by employees to purchase the goods or services of their employers, and secondary boycotts, which involve attempts to induce third parties to refuse to patronize the employer. The latter type of boycott is illegal in most states. Boycotts were used as a tactic in the U.S. civil rights movement of the 1950s and ’60s and also have been applied to influence the conduct of multinational corporations.

Boyer \bwa-'ya\, Charles (b. Aug. 28, 1897, Figeac, France — d. Aug. 26, 1978, Phoenix, Ariz., U.S.) French-U.S. actor. After earning a philosophy degree from the Sorbonne, he made his stage debut in Paris in 1920. He became a popular romantic leading man in French theatre and film, and his rich, accented voice and suave manner made him an international star. His first successful U.S. film, Private Worlds (1935), was followed by such films as Algiers (1938) and Gaslight (1944).

Boyle, Kay (b. Feb. 19, 1902, St. Paul, Minn., U.S.— d. Dec. 27, 1992, Mill Valley, Calif.) U.S. writer. Boyle lived in Europe during the 1920s and ’30s. Later she served as a European correspondent for The New Yorker (1946-53). Her writing is noted for its elegant style and consistently leftist stance. Her novels, which include Plagued by the Nightingale (1931) and Generation Without Farewell (1960), are less highly regarded than her short stories, which include “The White Horses of Vienna,” “Keep Your Pity,” and “Defeat.”

Boyle, Robert (b. Jan. 25, 1627, Lismore Castle, County Waterford, Ire. — d. Dec. 31, 1691, London, Eng.) Irish-born English chemist and natural philosopher. The son of Richard Boyle, the “Great Earl of Cork” (1566-1643), he settled at Oxford in 1654 and, with his assistant Robert Hooke, began his pioneering experiments on the properties of GASes, including those expressed in Boyle’s law (see gas laws). He demonstrated the physical characteristics of air, showing that it is necessary in combustion, respiration, and sound transmission. In The Sceptical Chymist (1661) he attacked Aristotle’s theory of the four elements (earth, air, fire, and water), espousing a corpuscular view of matter that presaged the modern theory of chemical elements. A founding member of the Royal Society of London, he achieved great renown in his lifetime. His brother Roger Boyle, earl of Orrery (1621-79), was a general under Oliver Crom-

well but eventually helped secure Ireland for Charles II.

Boyne, Battle of the (July 1690) Victory in Ireland for William III of England, a Protestant, over the former king James II, a Roman Catholic. James was attempting, with the help of the French and the Irish, to regain his throne. In this battle, fought on the banks of the River Boyne, some 35,000 men under William defeated about 21,000 of James's troops, forcing James to flee the country. The battle is celebrated in Northern Ireland as a victory for the Protestant cause.

boysen berry Very large bramble fruit, usually considered, along with the loganberry and the youngberry, a variety of blackberry (Rubus ursinus). The dark, reddish-black fruit is especially valued for canning and preserving. It is grown chiefly in the southern and southwestern U.S. and on the Pacific Coast from southern California into Oregon. It was developed in the early 1920s by Rudolph Boysen (1895-1950) of Napa, Cal.

BP PLC formerly Anglo-Persian Oil Co., Ltd., British Petroleum Co. PLC, and BP Amoco British petrochemical corporation. Formed in 1909 as the Anglo-Persian Oil Co., Ltd., to finance an oil-field concession granted by the Iranian government to William Knox D'Arcy, it became one of the largest oil companies in the world, with oil fields and refineries in Alaska and the North Sea. The British government was for many years BP's largest single stockholder, but by the late 1980s it had turned over the company to private ownership. In 1987 BP consolidated its U.S. interests by acquiring the Standard Oil Co. In 1998 it merged with Amoco (formerly Standard Oil of Indiana) to form BP-Amoco. In addition to oil and natural gas, it produces chemicals, plastics, and synthetic fibres. Its headquarters are in London.

Brabant \'bra-bant\ Old duchy, northwestern Europe. Located in what is now the southern part of The Netherlands and central and northern Belgium, the region in the 9th century ad was part of the kingdom of Lotharingia. In the late 12th century it became independent; it finally passed to the house of Burgundy in 1430. Inherited by the Habsburgs in 1477, it became a centre of culture and commerce (see Antwerp; Brussels). The northern section of Brabant took part in a revolt from Spain, and in 1609 it was awarded to the United Provinces, while the southern section remained part of Spanish (later Austrian) Netherlands. The northern section now forms the Dutch province of North Brabant. The southern section eventually became part of Belgium and is divided between the provinces of Flemish Brabant and Walloon Brabant.

Bracciolini, Gian Francesco Poggio See Gian Francesco Poggio Bracciolini

bracken or brake fern of the genus Pteridium, represented by a single species (P. aquilinum). Twelve varieties are found throughout the world in temperate and tropical regions. It is a noxious weed, with a perennial black rootstock that creeps extensively underground. At intervals along the rootstock, the plant sends up fronds that may reach a height of 15 ft (5 m) or more. Though they die in autumn, the fronds often remain standing throughout winter, affording cover for wildlife in some areas. The fronds are used for thatching and as fodder.

bracket fungus or shelf fungus Basidiomycete that forms shelflike

sporophores (spORE-producing organs). Bracket fungi are commonly found growing on trees or fallen logs in damp woodlands. They can severely damage cut lumber and stands of timber. Specimens 16 in. (40 cm) or more in diameter are not uncommon.

bract Modified, usually small, leaflike structure often positioned beneath a flower or inflorescence. What are often taken to be the petals of flowers are sometimes bracts — for example, the large, colourful bracts of poinsettias or the showy white or pink bracts of dogwood blossoms.

Bradbury, Ray (Douglas) (b. Aug. 22, 1920, Waukegan, 111., U.S.) U.S. author. Bradbury is best known for highly imaginative science-fiction stories and novels that blend social criticism with an awareness of the hazards of runaway technology. The Martian Chronicles (1950; television miniseries, 1980) is considered a science-fiction classic. His other short-story collections include The Illustrated Man (1951; film, 1969), The October Country (1955), I Sing the Body Electric! (1969; teleplay, 1981), and Quicker Than the Eye (1996); his novels include Fahrenheit 451 (1953; film, 1966), Dandelion Wine (1957; film, 1997), and Death Is a Lonely Business (1985).

Braddock, Edward (b. 1695, Perthshire, Scot. — d. July 13, 1755, Great Meadows, Pa.) British army commander in the French and Indian War. After service in Europe, he arrived in Virginia in 1755 to command British forces in North America against the French. He undertook an expedition to attack the French-held Fort Duquesne (now Pittsburgh, Pa.); his force, which included British regulars and provincial militiamen such as George Washington, cut the first road across the Allegheny Mountains and reached a point on the Monongahela River near the fort. There his army of over 1,400 men was ambushed and defeated by a group of 254 French and 600 Indians, and he was mortally wounded in the ensuing rout.

Bradford City and metropolitan borough (pop., 2001: 467,668), West Yorkshire, northern England. The manufacture of wool products was important to its economy as early as 1311; the fine worsted trade began in the late 17th century. By 1900 it emerged as the main wool-buying centre for Yorkshire. The city remains a centre of the textile industry and is the site of the University of Bradford.

Bradford, William (b. March 1590, Austerfield, Yorkshire, Eng. — d. May 9, 1657, Plymouth, Mass.) Governor of the Plymouth Colony in America for 30 years. A member of the Separatist movement within Puritanism, in 1609 he left England and went to Holland seeking religious freedom. Finding a lack of economic opportunity there, in 1620 he helped organize an expedition of about 100 Pilgrims to the New World. He helped draft the Mayflower Compact aboard the group’s ship, and he served as governor of the Plymouth Colony for all but five years from 1621 to 1656. He helped establish and foster the principles of self-government and religious freedom that characterized later American colonial government. His descriptive journal provides a unique source of information on both the voyage of the Mayflower and the challenges faced by the settlers.

Bradlee, Benjamin C(rowninshield) (b. Aug. 26, 1921, Boston, Mass., U.S.) U.S. newspaper editor. Bradlee was a reporter for The Wash-

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ington Post before joining Newsweek in Paris and then in Washington. Returning to the Post, he served as its executive editor 1968-91. During his tenure the Post published the Pentagon Papers, broke much of the story surrounding the Watergate scandal, and was recognized as one of the most important and influential newspapers in the U.S. Bradlee's books include Conversations with Kennedy (1975) and the memoir A Good Life (1995).

Bradley, Bill in full William Warren Bradley (b. July 28, 1943, Crystal City, Mo., U.S.) U.S. basketball player and politician. Bradley attended Princeton University (1961-65), where, as a playmaker and high-scoring forward 6 ft 5 in. (196 cm) tall, he was named College Player of the Year in 1964-65. In a semifinal game he scored 58 points, an NCAA tournament record. In 1964 he helped the U.S. team win the Olympic gold medal. He studied at the University of Oxford as a Rhodes scholar, then returned to play with the New York Knicks until 1977, helping them win two NBA championships (1970, 1973). As a prominent U.S. senator from New Jersey (1979-97), he sought to raise public awareness of race relations and poverty and was a critic of campaign-financing practices. In 1999-2000 he was an unsuccessful candidate for the Democratic presidential nomination.

her parents, and other Puritans to settle on Massachusetts Bay. She wrote many of her poems while rearing eight children. Without her knowledge, her brother-in-law took her poems to England, where they were published in 1650. She won critical acceptance in the 20th century, particularly for "Contemplations," a sequence of religious poems first published in the mid 19th century. Her prose works include "Meditations," a collection of aphorisms.

Brady, Mathew B. (b. c. 1823, near Lake George, N.Y., U.S. — d. Jan. 15, 1896, New York, N.Y.) U.S. photographer. He learned to make daguerreotypes from Samuel F.B. Morse. In 1844 he opened the first of two studios in New York City and began photographing famous people (including Daniel Webster, Edgar Allan Poe, and Henry Clay). In 1847 Brady opened a studio in Washington, D.C., and there created, copied, and collected portraits of U.S. presidents. He achieved international fame with A Gallery of Illustrious Americans (1850). In 1861 he set out to make a complete record of the American Civil War with a staff of more than 20 photographers, including Timothy H. O'Sullivan and Alexander Gardner. He probably photographed the battles of Bull Run, Antietam, and Gettysburg himself.

Bradley, F(rancis) H(erbert) (b. Jan. 30, 1846, Clapham, Surrey, Eng. — d. Sept. 18, 1924, Oxford) British idealist philosopher. Influenced by G.W.F. Hegel, he considered mind to be more fundamental than matter. In Ethical Studies (1876), he sought to expose confusions in utilitarianism. In The Principles of Logic (1883), he denounced the psychology of the empiricists. His most ambitious work, Appearance and Reality (1893), maintained that, though reality is spiritual, the thesis cannot be

demonstrated because of the fatally abstract nature of human thought. Instead of ideas, which could not properly contain reality, he recommended feeling, the immediacy of which could embrace the harmonious nature of reality. He was the first English philosopher to be awarded the Order of Merit. His brother was the eminent poetry critic A.C. Bradley (1851-1935).

Bradley, Omar N(elson) (b. Feb. 12, 1893, Clark, Mo., U.S. — d. April 8, 1981, New York, N.Y.) U.S. army commander. After graduating from West Point, he directed the army's infantry school at the start of World War II. In 1943 he commanded U.S. forces in the North Africa Campaign and contributed directly to the fall of Tunisia to the Allies; he then led the successful invasion of Sicily. As commander of the 1st Army, he helped plan the invasion of France and took part in the Normandy Campaign and the liberation of Paris. As commander of the 12th Army, the largest U.S. force ever placed under one general, he oversaw European operations until the German surrender. After the war he was appointed head of veterans' affairs (1945-47) and chief of staff of the army (1948-49). Admired by both officers and men, he was chosen the first chairman of the Joint Chiefs of Staff (1949-53) and promoted to General of the Army (1950).

Bradley, Thomas (b. Dec. 29, 1917, Calvert, Texas, U.S. — d. Sept. 29, 1998, Los Angeles, Calif.) Mayor of Los Angeles (1973-93). The son of a sharecropper, he moved with his family to Los Angeles when he was seven and endured poverty after his father abandoned the family. In 1940 he began a 22-year tenure with the city's police department, during which he earned a law degree (1956) by attending night school. In 1963 he became the city's first African American council member, and in 1973 he was elected one of the country's first two African American mayors of a major city (with Coleman Young of Detroit). During five terms as mayor, he helped transform Los Angeles into a bustling business and trading centre, overseeing massive growth and hosting the 1984 Olympic Games. He retired in 1992 after the city was consumed by riots following the acquittal of police officers in the beating of African American motorist Rodney King.

Bradman, Don (b. Aug. 27, 1908, Cootamundra, N.S.W., Austl. — d. Feb. 25, 2001, Adelaide, S.Aus.) Australian cricketer. One of the greatest run scorers in the history of the game, in test (international) matches Bradman scored 6,996 runs for Australia and set a record with his average of 99.94 runs per match. In 1948 he was captain of the Australian team that was victorious in England, four matches to none. He retired from first-class cricket in 1949 and was knighted in the same year. Bradman is often judged the greatest cricket player of the 20th century.

Bradstreet, Anne orig. Anne Dudley (b. c. 1612, Northampton, Northhamptonshire?, Eng. — d. Sept. 16, 1672, Andover, Massachusetts Bay Colony) English-born American poet, one of the first poets of the American colonies. At age 18 she sailed from England with her husband,

Bragg, Braxton (b. March 22, 1817, Warrenton, N.C., U.S. — d. Sept. 27, 1876, Galveston, Texas) U.S. and Confederate army officer. He graduated from West Point and served in the Seminole Wars and the Mexican War. When North Carolina seceded,

he joined the Confederate army and fought in the American Civil War. He was promoted to general in 1862 at the Battle of Shiloh. As commander of the Army of Tennessee, he led his troops to victory at the Battle of Chickamauga. His forces besieged the Union troops at Chattanooga but were eventually routed. He was relieved of his command but appointed military adviser to Confederate Pres. Jefferson Davis.

Bragg law Relation between the spacing of atomic planes in crystals and the angles of incidence at which the planes produce the most intense reflections of electromagnetic radiation and particle waves. The law, first formulated by Lawrence Bragg, is useful for measuring wavelengths and for determining the lattice spacings of crystals (see crystal lattice), and is the principal way to make precise energy measurements of X rays and low-energy gamma rays. See also William Bragg.

Braxton Bragg, engraving by George E. Perine

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Bragg, Sir William (Henry) (b.

Eng. — d. March 12, 1942, London) state physics. With his son (William) Lawrence Bragg (1890-1971), he shared a 1915 Nobel Prize for research on the determination of crystal structures and Lawrence’s discovery (1912) of the Bragg law of X-ray diffraction. The Bragg ionization spectrometer William designed and built is the prototype of all modern X-ray and neutron diffractometers; the two men used it to make the first exact measurements of X-ray wavelengths and crystal data.

Brahe Vbra, 'bra-he\, Tycho (b. Dec. 14, 1546, Knudstrup, Scania, Den. — d. Oct. 24, 1601, Prague) Danish astronomer. Kidnapped by his wealthy but childless uncle, he was raised at his uncle’s castle and educated at the Universities of Copenhagen and Leipzig. He trav-

eled through Europe (1565-70),

. July 2, 1862, Wigton, Cumberland,
British scientist, a pioneer in solid-

Tycho Brahe, engraving by Hendrik
Goltzius of a drawing by an unknown
artist, c. 1 586.

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acquiring mathematical and astronomical instruments, and, on inheriting his father’s and uncle’s estates, he built a small observatory. In 1573 he reported his discovery of a new star (later recognized as a supernova), news that shook faith in the immutable heavens. With the aid of Denmark’s King Frederick II, he built a new, larger observatory (Uraniborg), which became northern Europe’s centre of astronomical study and discovery. There he undertook a comprehensive study of the solar system and accurately charted the positions of more than 777 fixed stars. The observational data left at his death was used by his pupil and assistant Johannes Kepler to lay the groundwork for Isaac Newton’s work.

Brahma One of three major gods in late Vedic Hinduism, c. 500 bc-c. ad 500. He was gradually eclipsed by the other two, Vishnu and Shiva. In classical times the doctrine of Trimurti identified the three as aspects of a supreme deity. Brahma was associated with the creator god Prajapati, whose identity he came to assume. All temples of Shiva or Vishnu contain an image of Brahma, but today there is no sect or cult devoted exclusively to him.

brahma-loka Vbra-mo-To-koX In Hinduism and Buddhism, the realm of pious celestial spirits. In Theravada, it includes the 20 uppermost planes of existence. The lower 16 of these are the rupa-brcihma-loka, material realms inhabited by progressively radiant gods. The highest four realms, the arupa-brahma-loka, are devoid of substance. Rebirth into these realms is the reward for great virtue and meditation; the level attained is determined by faithfulness to the Buddha, the dharma and the sangha. See also ARUPA-LOKA, RUPA-LOKA.

Brahmagupta V.bra-mo-'gup-toX (b. 598 — d. c. 665, possibly Bhillamala, Rajasthan, India) Indian mathematician and astronomer. His principal work, the Brahma-sphuta-siddhanta (“The Opening of the Universe”), most of which deals with planetary motion, also contains important proofs of various geometrical theorems on quadratic equations, the geometry of right triangles, and the properties of geometric solids.

Brahman In the Upanishads, the eternal, infinite, and omnipresent spiritual source of the finite and changing universe. The schools of Vedanta differ in interpreting Brahman. The Advaita school defines Brahman as categorically different from any phenomenon, conceiving it as an absolute reality onto which human perceptions of differentiation are projected. The Bhedabheda school maintains that Brahman is not different from the world it produces. The Visistadvaita school holds that phenomenality is a glorious manifestation of Brahman. The Dvaita school maintains that both soul and matter are separate from and dependent on Brahman.

Brahman \'bra-mon\ or zebu \'ze-,bu\ Any of several varieties of CATTLE that originated in India and were crossbred in the U.S. with improved beef breeds to produce the hardy beef animal known as the Santa Gertrudis. Similar blending in Latin America resulted in the breed known as Indo-Brazil. The Brahman is characterized by a pronounced hump over the shoulder and neck, horns that usually curve up and back, and drooping ears. Gray is the prevalent colour, with deep shading in the fore and rear quarters of the bull. A red strain has also been developed.

Brahman or Brahmin Any member of the highest of the four varnas, or social classes, in Hindu India. Their existence as a priestly caste dates to the late Vedic period, and they have long been considered to be of greater ritual purity than members of other castes and alone to be capable of performing certain religious tasks, including preservation of the collections of Vedic hymns. Because of their high prestige and tradition of education, they dominated Indian scholarship for centuries. As the spiritual and intellectual elite, they advised the politically powerful warrior caste, and after Indian independence they supplied many heads of state. They still retain traditional privileges, though these are no longer legally sanctioned. Ritual purity is maintained through taboos, vegetarianism, and abstention from certain occupations.

Brahmana Vbra-mo-noN Any of a number of discourses on the Vedas that explain their use in ritual sacrifices and the symbolism of the priests’ actions. Dating to 900-600 bc, they constitute the oldest historical sources for Indian ritual. The Aitareya and Kausitaki Brahmana, compiled by followers of the Rig Veda, include discussions of daily sacrifices, the sacrificial fire, new- and full-moon rites, and the rites for installation of kings. The Pancavimsa, Sadvimsa, and Jaiminiya Brahmana discuss the “going of the cows,” soma ceremonies, and atonements for mistakes in ritual. The Satapatha Brahmana introduces elements of domestic ritual, and the Gopatha Brahmana treats the priests’ supervision of sacrifices.

Brahmaputra ^bra-mo-'pii-troX River River, Central and South Asia. From its headsprings in Tibet (as the Zangbo River), it flows across southern Tibet to break through the Himalayas in great gorges (where it is known as the Dihang). It flows southwest through the Assam Valley and south through Bangladesh (where it is known as the Jamuna). There it merges with the Ganges (Ganga) to form the Ganges-Brahmaputra delta. About 1,800 mi (2,900 km) long, the river is an important source for irrigation and transportation. Its upper course was long unknown, and its identity with the Zangbo was only established by exploration in 1884-86.

Brahmo Samaj Vbra-mo-so-'majX Monotheistic movement within Hinduism, founded in Calcutta (now Kolkata) in 1 828 by Ram Mohun Roy. It rejected the authority of the Vedas and the doctrine of avatars, did not

insist on belief in karma or rebirth, denounced polytheism and the caste system, and adopted some Christian practices. Roy's intention was to reform Hinduism from within, but his successor, Debendranath Tagore, rejected Vedic authority. In 1866 Keshab Chunder Sen organized the more radical Brahmo Samaj of India, which campaigned for the education of women and against child marriages. After Keshab nonetheless arranged a marriage for his underage daughter, a third group, Sadharan Brahmo Samaj, was formed in 1878. It gradually reverted to the teaching of the Upanishads but continued the work of social reform. The movement, always an elite group without significant popular following, lost force in the 20th century.

Brahms, Johannes (b. May 7, 1833, Hamburg — d. April 3, 1897, Vienna, Austria-Hungary) German composer. The son of a musician, he became a piano prodigy. In 1853 he met the composer Robert Schumann and his pianist wife, Clara (see Clara Schumann); Robert immediately proclaimed him a genius, and Clara became the lifelong object of his affections. In 1863 Brahms moved to Vienna, which would remain his principal home until his death. He took several positions as choral and orchestral conductor and performed as a soloist. The success of his German Requiem (1868) gave him an international reputation; his first symphony (1876) brought him even greater fame, and his violin concerto (1879) and second piano concerto (1882) led many to acclaim him the greatest living composer. His music complemented and counteracted the rapid growth of Romantic individualism in the second half of the 19th century. He was a traditionalist in the sense that he greatly revered the subtlety and power of movement displayed by the Classical composers Haydn, Mozart, and Beethoven. His orchestral works include four symphonies (1876, 1877, 1883, 1885), two piano concertos (1858, 1881), a violin concerto (1878), and a double concerto for violin and cello (1887). His chamber music includes four string quartets, two string sextets, two string quintets, three piano quartets, three piano trios, and violin, cello, piano, and clarinet sonatas. He also wrote choral music and more than 250 lieder (see lied).

Braille \'bral\ Universal system of writing and printing for the blind. The Frenchman Louis Braille invented the system in 1824. Characters embossed on paper are read by passing the fingers lightly over the manuscript. The system is based on a matrix of six dots arranged in two columns of three. The 63 combinations possible in this framework stand for letters, numbers, punctuation marks, and common words such as and and the. A Braille code for English was not adopted until 1932. Modifications

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The alphabet and the digits 0-9 in the modern Braille system. Each letter or digit consists of six "cells" that are either embossed or left blank to form a unique pattern. Large dots indicate raised cells; smaller dots indicate cells that are left blank

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also exist for other languages, for mathematical and technical material, and for musical notation. Braille may be handwritten — from right to left — using a stylus to press dots into a piece of paper between hinged metal plates; when the sheet is turned over, the dots face up and are read from left to right. Braille typewriters and electric embossing machines are also used.

Braille \'bray\, Louis (b. Jan. 4, 1809, Coupvray, near Paris, France — d. Jan. 6, 1852, Paris) French educator who developed the Braille system of printing and writing for the blind.

Himself blinded at the age of three in an accident, he went to Paris in 1819 to attend the National Institute for Blind Children, and from 1826 he taught there. Braille adapted a method created by Charles Barbier to develop his own simplified system.

brain Concentration of nerve tissue in the front or upper end of an animal's body. It handles sensory information, controls motion, is vital to instinctive acts, and in higher vertebrates is the centre of learning. Vertebrate brains consist of the

hindbrain (rhombencephalon), midbrain (mesencephalon), and forebrain (prosencephalon). The

hindbrain comprises the medulla oblongata and the pons, which connects the spinal cord with higher brain levels and transfers information from the cerebral cortex to the cerebellum. The midbrain, a major sensory integration centre in other vertebrates, serves primarily to link the hindbrain and forebrain in mammals. Large nerve bundles connect the cerebellum to the medulla, pons, and midbrain. In the forebrain the two cerebral hemispheres are connected by a thick bundle of nerve fibres (corpus callosum) and are divided by two deep grooves into four lobes (frontal, parietal, temporal, and occipital). The cerebrum, the largest part of the human brain, is involved with its more complex functions. Motor and sensory nerve fibres from each hemisphere cross over in the medulla to control the opposite side of the body.

Side view of the brain showing its major structures. The large cerebrum is divided into two halves, or hemispheres, connected by the corpus callosum, a band of nerve fibres. Two grooves divide the hemispheres into four lobes: frontal, temporal, parietal, and occipital. Many nerve cells are found in the convoluted cerebrum's outer surface, or cerebral cortex, which controls sensory and motor activities. The thalamus relays incoming sensory impulses from the spinal cord to the cortex. The hypo-

thalamus's many functions include control of breathing, blood flow, temperature regulation, and emotions. The pituitary gland is attached to and regulated by the hypothalamus. The midbrain relays signals between the forebrain and hindbrain. The cerebellum, along with the cerebrum, plays a role in voluntary movement as well as balance. The pons serves as a relay point linking the medulla oblongata, midbrain, cerebellum, and cerebrum. The medulla, lying between the pons and the spinal cord and continuous with both, plays a role in essential involuntary regulatory and reflexive responses (including breathing, swallowing, and heartbeat) and relays signals between the spinal cord and other brain regions.

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brain death State of irreversible destruction of the brain. Before the invention of life-support systems, brain death always led quickly to death of the body. Ethical considerations are crucial to defining criteria for brain death, which in most countries must be met before efforts to extend life may be ended. Such criteria include deep coma with a known cause, absence of any brainstem functions (e.g., spontaneous respiration, pupil reactions, gag and cough reflexes), and exclusion of hypothermia, drugs, and poison as causes. Electroencephalography is useful but not essential in determining brain death. Organ donors must be declared brain-dead before their organs may be removed for transplant. The question of when life support can legally be ended has been the subject of numerous court cases.

brain laterality See laterality

Brain Trust Group of advisers to Franklin Roosevelt in his 1932 presidential campaign. Its principal members were the Columbia University professors Raymond Moley, Rexford Tugwell, and Adolf A. Berle, Jr. (1895–1971). They presented Roosevelt with analyses of national social and economic problems and helped him devise public-policy solutions. The group did not meet after Roosevelt became president, but members served in government posts. See also New Deal.

brainwashing Systematic effort to destroy an individual’s former loyalties and beliefs and to substitute loyalty to a new ideology or power. It has been used by religious cults as well as by radical political groups such as the Chinese Communists in 1949. The techniques of brainwashing usually involve isolation from former associates and sources of information; an exacting regimen calling for absolute obedience and humility; strong social pressures and rewards for cooperation; physical and psychological punishments for noncooperation, including social ostracism and criticism, deprivation of food, sleep, and social contacts, bondage, and torture; and constant reinforcement. Its effects are sometimes reversed through deprogramming, which combines confrontation and intensive psychotherapy.

brake Device for decreasing the speed of a body or stopping its motion. Most brakes act on rotating mechanical elements and absorb kinetic energy mechanically, hydrodynamically, or electrically. Mechanical brakes are the most common; they dissipate the kinetic energy as heat generated by mechanical friction between a rotating drum or disk and a stationary friction element. A hydrodynamic (fluid) brake has a rotor (rotating element) and a stator (stationary element). Resistance to rotation is created by fluid

caliper housing

brake shoe piston

A disc brake assembly. Wheel rotation is slowed by friction when the hydraulic pistons squeeze the caliper, pressing the brake pads (shoe and lining assemblies) against the spinning disc (rotor), which is bolted to the wheel hub.

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Louis Braille, portrait bust by an unknown artist.

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friction and circulation of the liquid (usually water) from a series of pockets in the rotor to a series of complementary pockets in the stator. See also AIR BRAKE.

brake See bracken

Bramah, Joseph (b. April 13, 1748, Stainborough, Yorkshire, Eng. — d. Dec. 9, 1814, London) British engineer and inventor. Originally a cabinetmaker, Bramah in 1784 devised a pick-proof lock, which defied all efforts for 67 years. Since the success of his locks depended on their complexity, they could be produced in quantity only after the creation of a set of well-designed and precisely engineered machine tools, for which he hired a brilliant young blacksmith, Henry Maudslay. Their prototype machines were essential to the founding of the machine-tool industry. Bramah’s hydraulic press found many industrial uses and led to the development of hydraulic machinery.

Bramante \bra-'man-ta\, Donato (b. 1444, probably at Monte Asdruvaldo, Duchy of Urbino — d. April 11, 1514, Rome) Italian architect and perspectivist painter. The son of a farmer, he was working as a painter by 1477. His early architectural works included the church of Santa Maria presso San Satiro (c. 1480), in which the choir is painted in perspective to give an illusion of a much larger space. In 1499 he went to Rome, where he spent the rest of his

life. His Tempietto was the first masterpiece of the High Renaissance.

Under the patronage of Pope Julius II, he drew up plans for the immense Belvedere courtyard in the Vatican (begun c. 1505) and the new St.

Peter's Basilica (begun 1506), his greatest work. These ambitious projects were far from complete at the time of his death. Despite the grandiose scale of the St. Peter's undertaking, Bramante continued to work on other projects and played an important role in Julius II's plans for rebuilding Rome.

bramble Any plant of the genus Rubus (rose family), consisting of usually prickly shrubs, including raspberries and blackberries. Brambles grow wild throughout North America, as well as in Europe and Asia, and are widely cultivated for their fruits.

Brampton City (pop., 2001: 325,428), southeastern Ontario, Canada. Located west of Toronto, it was founded c. 1830. It was incorporated as a town in 1873 and as a city in 1976. Its industries include flower growing, tanning, lumbering, and the manufacture of automobiles, shoes, stationery, furniture, and optical equipment.

Bran Vbran\ In Celtic religion, a gigantic deity described in the AAabinogion as king of Britain. He was so large that he and his court lived in a tent rather than a house. When Bran was mortally wounded, he asked his companions to cut off his head and keep it with them, telling them it would provide entertainment and allow them to forget their sorrows. His companions passed 80 joyous years, eventually following his instructions and burying the head on the White Mount in London, where it protected England from invaders until it was finally unearthed.

bran Edible broken seed coat, or protective outer layer, of wheat, rye, or other cereal grain, separated from the kernel. In flour processing, it is normally removed from the ground kernels by sifting them in a rotating, meshed, cylindrical frame; whole-grain flours retain the bran. Wheat bran, the most widely processed, contains 16% protein, 11% natural fibre, and 50% carbohydrate. Most bran is coarsely ground for stock feed. In a more refined form, it is used in breakfast cereal, breads, and muffins for its value to the human digestive system as roughage.

Branch Davidians Religious sect that believes in the imminent return of Jesus Christ. It was founded in 1935 near Waco, Texas, by Victor Houteff as a breakaway group from the Seventh-Day Adventists. Under the leadership of Vernon Howell, a charismatic and apocalyptic preacher who would take the name David Koresh (1959-1993), it stockpiled weapons at its compound, where some 130 followers were living by 1993. That

year, after a shoot-out in which four federal agents were killed, federal law-enforcement agencies besieged the compound for 5 1 days. The standoff ended, at the orders of Attorney General Janet Reno, in a conflagration in which some 80 members died, including several children and Koresh himself. Intense controversy about the precise circumstances and

the necessity of the final assault led to a Congressional investigation, which in 2000 exonerated federal agents.

Brancusi, Constantin (b. Feb. 21, 1876, Hobija, Rom. — d. March 16, 1957, Paris, Fr.) Romanian-born French sculptor. He became adept at carving wooden farm implements as a child and later studied in Bucharest and Munich and at the Ecole des Beaux-Arts in Paris, having walked most of the way from Munich. He first exhibited in Paris in 1906. In 1908 he executed Sleeping Muse , influenced by Auguste Rodin, and The Kiss, his first truly original work. He developed a geometric style that became his hallmark, reducing natural forms to an abstract simplicity. He exhibited five works, including Mademoiselle Pogany, in the 1913 Armory Show. One of his favourite themes was a bird in flight; his most famous treatment was the celebrated polished-bronze Bird in Space (1919). Through numerous exhibitions in the U.S. and Europe, he achieved great fame and success, and he is regarded as a pioneer of modern abstract sculpture.

Brandeis Vbran-,dls\, Louis (Dembitz) (b. Nov. 13, 1856, Louisville, Ky., U.S.— d. Oct. 5, 1941, Washington, D.C.) U.S. jurist. The son of Bohemian Jewish immigrants, he attended schools in Kentucky and Germany before obtaining his law degree from Harvard (1877). As a lawyer in Boston (1877-1916), he was known as “the people’s attorney” for his defense of the constitutionality of several state hours-and-wages laws, his devising of a savings-bank life-insurance plan for working people, and his efforts to strengthen the government’s anti-trust power. His work influenced passage in 1914 of the Clayton Anti-Trust Act and the Federal Trade Commission Act. He also developed what came to be called the “Brandeis brief,” in which economic and sociological data, historical material, and expert opinion are marshaled to support a legal argument. Appointed to the Supreme Court of the United States (1916), he was noted for his devotion to freedom OF speech. Many of his minority opinions, in which he was often aligned with Oliver Wendell Holmes, Jr., later were accepted by the court in the New Deal era. His appointment as the first Jewish justice was vigorously opposed by some business interests and anti-Semitic groups. He served until 1939. Brandeis University is named for him.

Brandenburg Historical region and province of Prussia. The earliest Germanic inhabitants were replaced by Slavic Wends, who in turn were overcome in the 12th century by Albert the Bear, margrave of Brandenburg. It became one of the seven electorates of the Holy Roman Empire in 1356. Under the elector Frederick William (1640-88), Brandenburg-Prussia grew to be a leading power. It became a province of Prussia in 1815 and remained such after the unification of Germany (1871) and until the end of World War II. After the war, the eastern portion became part of Poland and the western portion part of East Germany. After Germany’s reunification in 1990, the western part became a German state. Brandenburg city, or Brandenburg an der Havel (pop., 2002 est.: 76,400), was formerly the

residence of Prussia’s reigning family.

Brandenburg Gate The only remaining town gate of Berlin, it is located at the western end of the avenue Unter den Linden. Carl G. Langhans (1732-1808), who built the gate (1789-93), modeled it after the propylaeum of the Athenian Acropolis. On top was the “Quadriga of Victory,” a statue of a chariot drawn by four horses. Heavily damaged in World War II, the gate was restored in 1957-58. From 1961 to 1989 the Berlin Wall shut off access to it for both eastern and western Germans; the gate was reopened in 1989 with the reunification of East and West Berlin.

Brandes Vbran-d9s\, Georg (Morris Cohen) (b. Feb. 4, 1842, Copenhagen, Den. — d. Feb. 19, 1927, Copenhagen) Danish critic and

Louis Brandeis.

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scholar. His published lectures at the University of Copenhagen, Main Currents in 19th-Century Thought, 6 vol. (1872-90), catalyzed the breakthrough from Romanticism to realism in Danish literature. His calls for writers to work in the service of progressive ideas and the reform of modern society, along with his championing of such writers as Henrik Ibsen and August Strindberg, earned strong conservative opposition but exerted enormous influence throughout Scandinavia. His other critical works include Men of the Modern Breakthrough (1883) and Danish Poets (1877).

Brando, Marlon, (Jr.) (b. April 3, 1924, Omaha, Neb., U.S. — d. July 1, 2004, Los Angeles, Calif.) U.S. actor. He gained stardom on Broadway as Stanley Kowalski in A Streetcar Named Desire (1947). An early member of the Actors Studio, he brought its method acting style to his first film, The Men (1950). His slurred, mumbling delivery marked his rejection of classical dramatic training, and his true and passionate performances proved him one of the great actors of his generation. After starring in the screen version of Streetcar (1951), he appeared in films such as The Wild One (1954), On the Waterfront (1954, Academy Award), The Godfather (1972, Academy Award), Last Tango in Paris (1972), and Apocalypse Now (1979).

Brandt, Bill orig. Hermann Wilhelm Brandt (b. May 1904, Hamburg, Ger. — d. Dec. 20, 1983, London, Eng.) German-born British photographer. In 1929 he worked in the studio of Man Ray in Paris. He

returned to England in 1931 and took up photojournalism, documenting English industrial workers in the 1930s and covering the home front during World War II. His work reveals the influence of Eugene Atget, Brassaï, and Henri Cartier-Bresson. He is best known for his photographs of British life and especially for his unconventional nudes; he placed his wide-angle camera at close range to the human body, causing a distorted effect that transformed the human body into a series of abstract designs.

Brandt, Willy orig. Herbert Ernst Karl Frahm (b. Dec. 18, 1913, Liibeck, Ger. — d. Oct. 8/9, 1992, Unkel, near Bonn) German statesman. As a young Social Democrat, he fled to Norway to avoid arrest after the rise of the Nazis in the 1930s. There he assumed the name Willy Brandt and worked as a journalist. Returning to Germany after World War II, he was elected to parliament in 1949 and became mayor of West Berlin (1957-66), a post in which he achieved world fame. He led a coalition government as chancellor of the Federal Republic of Germany (1969-74). As chancellor, he improved relations with East Germany, other communist nations in eastern Europe, and the Soviet Union and helped strengthen the European Economic Community. For these efforts he received the Nobel Prize for Peace in 1971. He remained the leader of the Social Democratic Party until 1987.

brandy Alcoholic beverage distilled from wine or a fermented fruit mash. The name comes from the Dutch brandewijn, “distilled wine.” Most brandies are aged and contain about 50% alcohol by volume. Some are darkened with caramel. They are usually served alone as after-dinner drinks but are sometimes used in mixed drinks or dessert dishes or as fuel in flamed dishes such as crepes suzettes and cherries jubilee. They are also used as the base of various liqueurs. The finest brandy is usually thought to be French cognac.

Brandywine, Battle of the (Sept. 11, 1777) Battle in the American Revolution. British Gen. William Howe attempted to remove Pennsylvania from the war by engaging troops under Gen. George Washington on Brandywine Creek, 25 mi (40 km) from the revolutionary capital of Philadelphia. In the end, the British troops occupied the battlefield but failed to destroy Washington’s army or cut it off from Philadelphia. This failure contributed to the later British defeat at the Battle of Saratoga.

Brant, Joseph (b. 1742, banks of the Ohio River — d. Nov. 24, 1807, near Brantford, Ont., Can.) Mohawk Indian chief and Christian missionary. Brant was converted to the Anglican church while attending a school for Indians in Connecticut. He fought for the British in the last French and Indian War (1754-63).

He led four of the six Iroquois nations on the British side in the American Revolution, winning several notable battles. After the war Brant was granted land along the Grand River in Ontario, Can., where he ruled peacefully and continued his missionary work.

Brant, Sebastian (b. 1458?,

Strassburg — d. May 10, 1521,

Strassburg) German poet. He taught law and later was appointed imperial councillor and court palatine by Maximilian I. His varied writings include works on law, religion, politics, and especially morals. His best-known work is The Ship of Fools (1494), an allegory telling of fools on a ship bound for a “fool’s paradise.” The most famous German literary work of the 15th century, it ridicules the vices of the age and gave rise to a whole school of fool’s literature.

Braque \'brak\, Georges (b. May 13, 1882, Argenteuil, France — d. Aug. 31, 1963, Paris) French painter. He studied painting in Le Havre, then in Paris at a private academy and briefly at the Ecole des Beaux-Arts. Though his earliest works were influenced by Impressionism, his first important paintings (1905-07) were in the style of Fauvism pioneered by Andre Derain and Henri Matisse; in 1907 he exhibited and sold six of these paintings at the Salon des Independants. Abandoning Fauvism in 1907, he invented with Pablo Picasso the revolutionary new style known as Cubism. He painted mostly still lifes featuring geometric shapes and low-key colour harmonies. In 1912 he introduced the collage, or papier colie (pasted-paper picture), by attaching three pieces of wallpaper to the drawing Fruit Dish and Glass. By the 1920s he was a prosperous, well-established modern master. In 1923 and 1925 he designed stage sets for Sergey Diaghilev’s Ballets Russes. He enjoyed a long and prestigious career; in his later years he was honoured with important exhibitions throughout the world. In 1961 he became the first living artist to have his works exhibited in the Louvre.

Bras d'Or \bra-'dor\ Lake Salt lake, Nova Scotia, Canada. Located on Cape Breton Island, it is about 50 mi (80 km) long and has an area of 360 sq mi (932 sq km). Its extension, Little Bras d’Or, connects it to the Atlantic Ocean on the north, while a man-made canal connects it to the Atlantic on the south. The lake is a popular summer resort area.

Brasilia City (pop., 2000: 2,043,169), capital of Brazil. It lies on the Parana River. Though the idea of having the country’s capital located in the interior was proposed as early as 1789, Brasilia’s construction began only in 1956. It was designed by the Brazilian architects Liicio Costa and Oscar Niemeyer. In 1960 the government began its move from Rio de Janeiro. The city is a governmental rather than an industrial centre, although many Brazilian companies have headquarters there. Brasilia National Park

is nearby.

Brasov or Brashov \bra-'shov\ German Kronstadt \'kron-,shtat\ City (pop., 2002: 588,366), Romania. It lies in the foothills of the Transylvanian Alps north of Bucharest. Founded by Teutonic Knights in 1211, it became the centre of a Saxon colony trading in cloth and metalwork throughout much of Walachia and Moldavia. The substantial autonomy of its German inhabitants ended in 1876 with the abolition of their separate national status. Brasov is today a centre for heavy manufacturing.

brass Alloy of copper and zinc, important for its hardness and workability. Brass was first used c. 1200 bc in the Near East, then extensively in China after 220 bc, and soon thereafter by the Romans. In ancient documents, including the Bible, the term brass is often used to denote bronze (copper/tin alloy). The malleability of brass depends on its zinc content; brasses with more than 45% zinc are not workable. Alpha brasses contain less than 40% zinc; beta brasses (40-45% zinc) are less ductile than alpha brasses but stronger. A third group includes brasses with additional elements. Among these are lead brasses, which are more easily machined;

Willy Brandt.

AUTHENTICATED NEWS INTERNATIONAL

Joseph Brant, portrait by Charles Willson Peale, 1 797; in Independence National Historical Park, Philadelphia

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naval and admiralty brasses, in which a small amount of tin improves resistance to corrosion by seawater; and aluminum brasses, which provide strength and corrosion resistance where the naval brasses may fail.

brass instrument Musical wind instrument, usually made of brass or other metal, in which the vibration of the player’s lips against a cup- or funnel-shaped mouthpiece causes the initial vibration of an air column. The TRUMPET, TROMBONE, FRENCH HORN, TUBA, EUPHONIUM, SOUSAPHONE, CORNET, flugelhorn, and bugle, as well as historical instruments such as the ophicleide, comett, and serpent, are considered brass instruments (though the last two were made of wood); the saxophones, though made of brass, are REED INSTRUMENTS classified as WOODWIND INSTRUMENTS.

BrassaV\bra-'sI\ orig. Gyula Halasz (b. Sept. 9, 1899, Brasso, Transylvania, Austria-Hungary — d. July 8, 1984, Eze, France) Hungarian-born French photographer, poet, and sculptor. His pseudonym derives from his native city. In 1924 he settled in Paris, where he became acquainted with Pablo Picasso, Joan Miro, and Salvador Dali. He earned his living as a journalist and found it necessary to use a camera for his assignments. In the 1930s he became known for his dramatic photographs of Paris nightlife. Books of his photographs, including Paris After Dark (1933) and Pleasures of Paris (1935), brought him international fame.

brassica Any plant of the large genus Brassica , in the mustard family, containing about 40 Old World species and including the cabbages, mustards, and rapes. B. oleracea has many edible varieties, such as broccoli, Brussels sprouts, cabbage, cauliflower, kale, and kohlrabi. Also included in this genus are the turnip (B . rapa), the rutabaga (B. napobrassica), and the Chinese cabbages (B . pekinensis and B. chinensis).

Bratislava \ l bra-ti- , sla-vo\ German Pressburg Vpres-.biuTA Hungarian Pozsony \'po-,zhon y \ City (pop., 2001 prelim.: 428,672), capital of Slovakia. Settled first by Celts and Romans, it was ultimately inhabited by Slavs in the 8th century. As Pressburg, it developed as a trade centre and became a free royal town in 1291. The first university in what was then Hungary was founded there in 1467. The city served as the Hungarian capital (1541-1784) and was the seat of the Diet until 1848. The Treaty of Pressburg (1805) was signed here by Napoleon and Francis II following the Battle of Austerlitz. After World War I, on the formation of Czechoslovakia, it became capital of the province of Slovakia, and it became the national capital on Slovakia’s independence in 1992.

Brattain \'bra-t 3 n\, Walter H(ouser) (b. Feb. 10, 1902, Amoy, China — d. Oct. 13, 1987, Seattle, Wash., U.S.) U.S. scientist. His American parents brought him to the U.S. soon after his birth. After earning a Ph.D. from the University of Minnesota, he became a researcher at Bell Laboratories in 1929. With John Bardeen and William B. Shockley, he shared the 1956 Nobel Prize for Physics for the development of the transistor and for investigation of the properties of semiconductors.

Brauchitsch Vbrau-kichV (Heinrich Alfred) Walther von (b.

Oct. 4, 1881, Berlin, Ger. — d. Oct. 18, 1948, Hamburg) German army officer. A member of the general staff in World War I, he rose to become field marshal and army commander in chief (1938). In World War II, he successfully directed Germany’s ground war until Adolf Hitler forced his resignation after suffering major losses in Russia in 1941 . He survived the war but died shortly before his scheduled trial as a war criminal.

Braudel \bro-'del\, (Paul Achille) Fernand (b. Aug. 24, 1902,

Lumeville, France — d. Nov. 28, 1985, Haute-Savoie) French historian and educator. While a prisoner of the Germans during World War II, Braudel wrote from memory his thesis on the history of the Mediterranean region in the 16th century, later published as The Mediterranean and the Mediterranean World in the Age of Phillip II (1949). With Marc Bloch and Lucien Febvre, he became an influential leader of the Annales school, which emphasized the effects of factors such as climate, geography, and

demographics on history. His second major work was Civilization and Capitalism, 15th-18th Century (1967, 1979).

Braun Vbraim\, Eva (b. Feb. 6, 1912, Munich, Ger. — d. April 30, 1945, Berlin) Mistress of Adolf Hitler. A saleswoman in the shop of Hitler's photographer, she became Hitler's mistress in the 1930s, living first in a house he provided in Munich, then at his chalet in Berchtesgaden. He never allowed her to be seen in public with him, and she had no influence on his political life. In April 1945 she joined him in Berlin, against his orders, as the Allied Powers were closing in on the capital. In recognition of her loyalty, he married her in a civil ceremony in the Chancellery bunker on April 29. The next day Eva Hitler ended her life by taking poison; her husband shot himself. In accordance with his instructions, their bodies were burned.

Braun VbraunV Wernher von

(b. March 23, 1912, Wirsitz, Ger. — d. June 16, 1977, Alexandria, Va., U.S.) German-bom U.S. rocket engineer. Born into an aristocratic family, he received his doctorate from the University of Berlin. In 1936 he became technical director of the new military development facility at Peenemiinde, an essential centre for the rearmament of Nazi Germany, forbidden by the Versailles accords. Liquid-fueled rocket aircraft and jet-assisted takeoffs were successfully demonstrated there, and the V-2 long-range ballistic missile and the Wasserfall supersonic antiaircraft missile were developed. By 1944 the sophistication of the rockets and missiles being tested at Peenemiinde was many years ahead of that of any other country. After World War II he and his team surrendered to the U.S.; they were immediately set to work on guided missiles by the U.S. Army, and in 1952 he became technical director (later chief) of the Army's ballistic weapon program. Under his leadership, the Redstone, Jupiter-C, Juno, and Pershing missiles were developed. In 1958 he and his group launched the first U.S. satellite, Explorer 1 . After NASA was formed, von Braun led the development of some of the large Saturn space launch vehicles; the engineering success of each of the Saturn class of space boosters remains unmatched in rocket history.

Braunschweig Vbraun-,shfik\ English Brunswick Administrative district, Lower Saxony, Germany. A possession of the Welf family, the duchy of Braunschweig (Brunswick-Liineberg) was created by Emperor

Frederick II in 1235 and included the lands surrounding the town of Braunschweig. The electorate of Hanover was included in 1692; its rulers established the English royal house of Hanover. The duchy became part of the German Empire in 1871 and a German state after 1919. After World War II the region was incorporated into the state of Lower Saxony. The city of Braunschweig (Brunswick; pop., 2003 est.: 245,076) is today an important industrial centre.

Brazil officially Federative Republic of Brazil Country, east-central South America. Area: 3,287,612 sq mi (8,514,877 sq km). Population (2005 est.): 184,016,000. Capital: Brasilia. Most Brazilians are of European or mixed (Indian-European, European- African) ancestry. Brazil’s ethnic groups have intermixed since the earliest days of its colonial history; Indian peoples who have experienced no mixing with immigrants are restricted to the most remote parts of the Amazon River basin. Language: Portuguese (official). Religions: Christianity (predominantly Roman Catholic; also Protestant); also traditional beliefs. Currency: real. Brazil may be divided into many regions, but the Amazon lowlands and the Brazilian Highlands (often called the Central Highlands or Central Plateau) dominate the landscape. The highlands, a plateau with an average elevation of 3,300 ft (1,000 m), are primarily in the southeast, while the Amazon lowlands, with elevations below 800 ft (250 m), are in the north. The Amazon River basin, with its more than 1 ,000 known tributaries, occupies nearly half of the country’s total area. Brazil’s other rivers include the Sao Francisco, Parnafba, Paraguay, Alto Parana, and Uruguay. Except for the islands of Marajo and Caviana at the mouth of the Amazon and Maraca to the north, there are no large islands along the roughly 4,600 mi (7,400 km) of Brazil’s Atlantic Ocean coast. There are good

"'Bijoux' in Place Pigalle Bar," by BrassaV, 1 932.

BRASSAI — RAPHO/PHOTO RESEARCHERS

Eva Braun, 1 944

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Mexico. The city of Waco is one of the largest on the river. Near its mouth it connects with the Gulf Intracoastal Waterway. The lower river valley was a major site of early Anglo-American settlement in Texas; one of the first English-speaking colonies there was founded by Stephen Austin at San Felipe de Austin in 1822. The river’s original name was Brazos de Dios (“Arms of God”).

Brazza \bra-'za\, Pierre (-Paul-Francois-Camille) Savorgnan

de (b. Jan. 26, 1852, near Rome [Italy] — d. Sept. 14, 1905, Dakar, Seneg., French West Africa) French explorer and colonial administrator. Born to

Italian nobility in Brazil, he joined the French navy. In 1875-78 he explored the Ogooue River (in present-day Gabon). Racing his British-U.S. counterpart, Henry Morton Stanley, Brazza was sent to explore the Congo River region. There he founded the French (Middle) Congo, explored Gabon, and founded the city of Brazzaville (1883), adding some 200,000 sq mi (500,000 sq km) to the French colonial empire. From 1886 to 1897 he governed a colony there.

Brazzaville \'bra-z9-,vil\ River port (pop., 1992 est.: 937,579), capital of Republic of the Congo. Lying on the north bank of the Congo River across from Kinshasa, it was founded in 1883 by Pierre Savorgnan de Brazza. Developed as a European administrative and residential center, it was used as a base for later claims of France to lands to the northeast; it became the capital of French Equatorial Africa. The river port forms the terminus of the Congo-ocean transport system, with steamer service to the Congo’s upper reaches and a railroad to Pointe-Noire 245 mi (394 km) west.

bread Baked food product. It is made of flour or meal that is moistened into a dough, kneaded, and usually leavened with yeast. A major food since prehistoric times, bread has been made worldwide in various forms using a variety of ingredients and methods. Flat, unleavened bread, the earliest

harbours at Belem, Salvador, Rio de Janeiro, Santos, and Porto Alegre.

The country’s immense forests are a source of many products, while its savannas support cattle raising. Agriculture is important, and mineral reserves are large. Brazil has a developing market economy based mainly on manufacturing, financial services, and trade. It is a federal republic with two legislative houses; its chief of state and government is the president. Little is known about Brazil’s early indigenous inhabitants.

Though the area was theoretically allotted to Portugal by the 1494 Treaty of Tordesillas, it was not formally claimed by discovery until Portuguese navigator Pedro Alvares Cabral accidentally touched land in 1500. It was first settled by the Portuguese in the early 1530s on the northeastern coast and at Sao Vicente (near modem Sao Paulo); the French and Dutch created small settlements over the next century. A viceroyalty was established in 1640, and Rio de Janeiro became the capital in 1763. In 1808 Brazil became the refuge and seat of the government of John VI of Portugal when Napoleon I invaded Portugal; ulti-

mately the Kingdom of Portugal,

Brazil, and Algarve was proclaimed,
and John ruled from Brazil (1815—

21). On John’s return to Portugal,

Pedro I proclaimed Brazilian inde-
pendence. In 1889 his successor,

Pedro II, was deposed, and a consti-
tution mandating a federal republic
was adopted. Beginning in the 20th
century, immigration increased and
manufacturing grew, and there were
frequent military coups and suspen-
sions of civil liberties. Construction
of a new capital at Brasilia, intended
to spur development of the country’s
interior, worsened the inflation rate.

After 1979 the military government began a gradual return to democratic practices, and in 1989 the first popular presidential election in 29 years was held. A severe economic crisis began in the late 1990s.

Brazil nut Edible seed of a large South American tree, Bertholletia excelsa (family Lecythidaceae), and one of the major commercially traded nuts in the world. The hard-walled fruit, resembling a large coconut, contains 8-24 nuts (seeds) arranged in it like sections of an orange. Each nut has a very hard shell and is three-sided in shape. Brazil nuts are high in fat and protein and taste somewhat like almond or coconut. The tree grows wild in stands in the Amazon River basin, reaching heights of 150 ft (45 m) or more.

brazing Process for joining two pieces of metal by applying heat and adding a filler metal. The filler, which has a lower melting point than the metals to be joined, is either pre-placed or fed into the joint as the parts are heated. In brazing parts with small clearances, the filler is able to flow into the joint by capillarity. The temperature of the molten filler in brazing exceeds 800°F (430°C). In soldering, a related process, the filler metal remains below that temperature. Brazed joints are usually stronger than soldered joints. Most metals can be brazed, and the range of available brazing ALLOYS has increased as new alloys and new service requirements are introduced. Brazed joints are highly reliable and are used extensively on rockets, jet engines, and aircraft parts. See also welding.

Brazos Vbra-Z3s\ River River, central Texas, U.S. Formed in eastern New Mexico, it flows southeast 1,280 mi (2,060 km) into the Gulf of

Georgetown w^Paramaribo
VENEZUELA GUYANA ! 1 v Cayenne

Mt. Roraima SURINAME^*

V MARAJO
\ k ISLAND

PACIFIC

OCEAN

ATLANTIC

OCEAN

BRAZ L

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form, is still eaten in the Middle East, Asia, and Africa. The principal grains used in such breads are wheat, barley, millet, buckwheat, rye, and corn. Raised bread, common in Europe and the U.S., is usually made of wheat or rye. Both contain the elastic protein substance gluten, which traps gas produced by fermentation during leavening, helping the bread to rise. While the simplest breads contain only flour, water, and yeast, other common ingredients are milk, shortening (fats, butter, oils), salt, eggs, and sugar. Bread is a source of complex carbohydrates and B vitamins (see vitamin B complex); whole- wheat bread contains more protein, vitamins, minerals, and fibre than white-flour bread. See also baking.

breadfruit Fruit of either of two closely related trees belonging to the mulberry family. Artocarpus communis (also called A. incisa or A. altilis) provides a staple food of the South Pacific. Its greenish to brownish-green, round fruits have a white, fibrous pulp. Treculia qfricana, native to tropical Africa, is less important as a food crop. Cultivated in the Malay Archipelago (where it is thought to be indigenous) since remote antiquity, the breadfruit was spread throughout the tropical South Pacific in prehistoric times. It is high in starch and is seldom eaten raw. Unable to tolerate frost, the tree has not been successfully grown in the U.S., even in southernmost Florida. In the South Seas, cloth is made from the inner bark, the wood is used for canoes and furniture, and glue and caulking material are obtained from the milky juice.

bream European food and game fish (Abramis brama) of the carp family (Cyprinidae). Found in lakes and slow rivers, the bream lives in schools and eats worms, mollusks, and other small animals. Deep-bodied, with flat sides and a small head, it is silvery with a bluish or brown back. It is usually about 12-20 in. (30-50 cm) long and

weighs up to 13 lbs (6 kg). Other species called bream include the silver bream (B lice a bjoorkna), the golden shiner, and the sea breams (family Sparidae).

breast cancer Malignant tumour in a breast, usually in women after menopause. Risk factors include family history of breast cancer, prolonged menstruation, late first pregnancy (after age 30), obesity, alcohol use, and some benign tumours. Most breast cancers are adenocarcinomas. Any lump in the breast needs investigation because it may be cancer. Treatment may begin with radical or modified mastectomy or lumpectomy (in which only the tumour is removed), followed by radiation therapy, chemotherapy, or removal of the ovaries or adrenal glands.

breathing See respiration

Brebeuf \bra-'boef\, Saint Jean de (b. March 25, 1593, Conde-sur-Vire, Normandy — d. March 16, 1649, Saint-Ignace, New France; canonized 1930; feast day October 19) French Jesuit missionary to New France. Ordained in 1623, he arrived in New France in 1625 to work as a missionary among the Huron. Forced out by the English in 1629, he returned to “Huronia” in 1634. In 1648 the Iroquois began their war against the Huron, and in 1649 they captured Brebeuf and tortured him to death. His writings include historical narratives and a Huron grammar. He is regarded as the patron saint of Canada.

breccia Vbre-choX Coarse sedimentary rock consisting of angular or nearly angular fragments larger than 0.08 in. (2 mm). Breccia commonly results from processes such as landslides or geologic faulting, in which rocks are fractured. It can also be of igneous explosive origin (e.g., a volcanic breccia).

Brecht Vbrekt\, Bertolt orig. Eugen Berthold Friedrich Brecht

(b. Feb. 10, 1898, Augsburg, Ger. — d. Aug. 14, 1956, East Berlin, E.Ger.) German playwright and poet. He studied medicine at Munich (1917-21) before writing his first plays, including Baal (1922). Other plays followed, including A Man ’s a Man (1926), as well as a considerable body of poetry. With the composer Kurt Weill he wrote the satirical musicals The Threepenny Opera (1928; film, 1931), which gained him a wide audience, and The Rise and Fall of the City of Mahagonny (1930). In these years he became a Marxist and developed his theory of epic theatre. With the rise of the Nazis he went into exile, first in Scandinavia (1933-41), then in

Bream (Abramis brama)

W.S. Pin- ERIC HOSKING

the U.S., where he wrote his major essays and the plays Mother Courage and Her Children (1941), The Life of Galileo (1943), The Good Woman of Sichuan (1943), and The

Caucasian Chalk Circle (1948). Harassed for his politics, in 1949 he returned to East Germany, where he established the Berliner Ensemble theatre troupe and staged his own plays, including The Resistible Rise of Arturo Ui (1957). He outlined his theory of drama in A Little Organum for the Theatre (1949).

Breckinridge, John C(abell)

(b. Jan. 21, 1821, near Lexington, Ky., U.S.— d. May 17, 1875, Lexington) U.S. politician, vice president (1857—61), and Confederate army officer. He practiced law and later served in the U.S. House of Representatives (1851-55). In 1856 he was elected vice president under James Buchanan. In 1860 the Democratic Party split into factions over the slavery issue, and Breckinridge became the Southern wing's nominee for president. Defeated by Abraham Lincoln, he worked for compromise; but after the firing on Fort Sumter he urged Kentucky to secede. He became a general in the Confederate army and took part in the Vicksburg, Wilderness, and Shenandoah Valley campaigns. He served as Confederate secretary of war in 1865. After the war he fled to England for three years before returning to Kentucky to resume his law practice.

Bertolt Brecht, 1 931

ULLSTEIN BILDERDIENST

Breda \bra-'da\, Declaration of (1660) Document issued by the exiled King Charles II in Breda, the Netherlands, making certain promises in return for his restoration to the English throne. It expressed his desire for a general amnesty, liberty of conscience, an equitable settlement of land disputes, and full payment of arrears to the army. He left the specifics to the Convention Parliament. See also Restoration.

breeding Application of genetic principles in animal husbandry, agriculture, and horticulture to improve desirable qualities. Ancient agriculturists improved many plants through selective cultivation. Modern plant breeding centers on pollination; pollen from the chosen male plant, and no other pollen, must be transferred to the female plant. Animal breeding consists of choosing the ideal trait (e.g., fine wool, high milk production), selecting the breeding stock, and determining the mating system (e.g., whether mating animals are unrelated, mildly related, or highly inbred).

Breisgau Vbrls-,gau\ Historic region, southwestern Germany. Located between the Rhine River and the Black Forest, it was once part of the Roman empire. From the 3rd century ad it was occupied by the Germanic Ale-

manni. It became a countship in the early Middle Ages, and in 1120 the town of Freiburg im Breisgau was founded. In the 14th century the Habsburgs incorporated most of it into their domains. Breisgau was subjected to destructive sieges during the Thirty Years' War, and for a time was held by the Swedes. It now forms part of the state of Baden-Wtirttemberg.

Brel, Jacques (b. April 8, 1929, Brussels, Belg. — d. Oct. 9, 1978, Bobigny, near Paris, France) Belgian singer and songwriter. He began his career singing in French cafes. His songs, frequently sharply satirical and often implicitly religious, became hugely popular in Europe. He acted in and directed a number of films from 1967 to 1973. His U.S. reputation was made by the revue Jacques Brel Is Alive and Well and Living in Paris (1968).

Bremen City (pop., 2002 est.: city, 540,950; metro, area, 849,800), northwestern Germany. Located on the Weser River, it was established as a diocese in 787 by Charlemagne and was the seat of an archbishopric from 845. In the 10th century it became an economic centre of northern Germany, especially after entering the Hanseatic League in 1358. It joined the German Confederation in 1815 and the reconstituted German Empire in 1871. It suffered extensive damage in World War II; after the war Bremen, with nearby Bremerhaven (pop., 2002 est.: 195,863), became a state of West Germany. Today the state, covering 156 sq mi (404 sq km), forms an integral part of the German economy and serves as headquarters for many industries.

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Bremen \'bra-m3n\ Former duchy, Germany. Lying between the lower Weser and lower Elbe rivers and northwest of the former duchy of BRUNSWICK-Liineburg, it covered an area of about 2,000 sq mi (5,200 sq km). It was made an archbishopric in the 13th century, and in 1648 became a duchy under the supremacy of Sweden. In 1715 it became part of the electorate of Hanover.

bremsstrahlung \'brem-,shtral-9q\ German "braking radiation"

Electromagnetic radiation produced by a sudden slowing down or deflection of charged particles, especially electrons, passing through matter in the vicinity of the strong electric fields of atomic nuclei. It occurs as cosmic rays pass through the Earth’s atmosphere and accounts for continuous X-ray spectra.

Brendan, Saint (b. 484/486, Tralee, Ire. — d. 578, Annaghdown, County Galway; feast day May 16) Celtic saint and hero of legendary Atlantic voyages. Educated by St. Ita at her school in southwestern Ireland, he became a monk and priest and was put in charge of the abbey at Ardfert. He later founded monasteries in Ireland and Scotland, notably

Clonfert (561). A famous traveler, he voyaged to the Hebrides and perhaps to Wales and Brittany. He was immortalized in Voyage of Brendan, an Irish epic translated into Latin in the 10th century that told of his journey to a “Promised Land of Saints,” and St. Brendan’s Island was long sought by explorers.

Brennan, William J(oseph), Jr. (b. April 25, 1906, Newark, N.J., U.S. — d. July 24, 1997, Arlington, Va.) U.S. jurist. He studied under Felix Frankfurter at Harvard Law School, receiving his degree in 1931. He practiced labour law in New Jersey until 1949, when he was appointed to the state Superior Court. He rose through the ranks of the New Jersey courts, where he was noted for his administrative skill. Although a Democrat, he was named to the Supreme Court of the United States by Republican Pres. Dwight D. Eisenhower in 1956. He came to be regarded as one of the most influential jurists in its history. A liberal constructionist and an articulate defender of the Bill of Rights, he is perhaps best remembered for his role in a series of obscenity cases, beginning with Roth v. United States (1957), many of which broadened the protection accorded to publishers while seeking to balance individual freedoms with the interests of the community. In New York Times v. Sullivan (1964), he wrote that even false statements about public officials are protected under the 1st and 14th Amendments unless “actual malice” can be demonstrated. He also wrote the majority opinion in Baker v. Carr (1962). He opposed capital punishment and supported abortion rights, affirmative action, and school desegregation. He served until 1990; his decisions numbered more than 1,350.

Brent, Margaret (b. c. 1600, Gloucestershire, Eng. — d. 1669/71, Westmoreland county, Va.) British colonial landowner in North America. She arrived in Maryland in 1638 and obtained a patent for 70 acres, becoming the first woman in the colony to hold land in her own right. By 1657 she was among the colony’s largest landowners. In a border dispute with Virginia in 1646, she organized a group of armed volunteers to support the Maryland colony’s governor, Leonard Calvert. On his death in 1647, she became executor of his estate and settled a dispute over back pay for his soldiers that had nearly led to civil war.

Brentano \bren-'ta-no\, Clemens (b. Sept. 9, 1778, Ehrenbreitstein, near Koblenz — d. July 28, 1842, Aschaffenburg, Bavaria) German poet, novelist, and dramatist. He was one of the founders of the Heidelberg Romantic school, which emphasized German folklore and history. With his brother-in-law Achim von Arnim (1781-1831), he published Des Knaben Wunderhorn (1805-08; The Youth’s Magic Horn), a collection of German folk lyrics (including successful imitations of folk style) that became an important inspiration to lyric poets and composers such as Gustav Mahler. Among his most successful works are his fairy tales, particularly Gockel, Hinkel and Gackeleia (1838).

Brentano \bren-'ta-no\, Franz (Clemens) (b. Jan. 16, 1838, Marienberg, Hesse-Nassau — d. March 17, 1917, Zurich, Switz.) German philosopher. Nephew of Clemens Brentano, he was ordained a priest in 1864 and taught at the University of Wurzburg (1866-73). Religious doubts led to his resignation from the priesthood in 1873. To present a systematic psychology that would serve as a science of the soul, he wrote the influential Psychology from an Empirical Standpoint (1874). He became the founder of act psychology, or intentionalism, which concerns itself with the mind’s “acts” or processes (e.g., perception, judgment, loving, and hating) rather than its contents. He later taught at the University of

Vienna (1874-80, 1881-95) and published works such as Inquiry into Sense Psychology (1907) and The Classification of Psychological Phenomena (1911).

Brescia Vbra-sha, 'bre-sho\ ancient Brixia City (pop., 2001 prelim.: 187,865), Lombardy region, northern Italy. Originally a Celtic stronghold, it was occupied by the Romans c. 200 bc and became the seat of a Roman colony in 27 bc. It was devastated by the Goths (ad 412) and plundered by Attila (452). It was a free city from 936 to 1426. It passed to Venice, France, and Austria before being united with Italy in 1860. Historic structures include Roman ruins and 11th- and 17th-century cathedrals. The art treasures in its numerous churches include works by painters of the 15th- and 16th-century Brescia school.

Breshkovsky, Catherine (b. 1844 — d. Sept. 12, 1934, near Prague, Czech.) Russian revolutionary. After becoming involved with the Narodnik (or Populist) revolutionary group in the 1870s, she was arrested and exiled to Siberia for the years 1874-96. In 1901 she helped organize the Socialist Revolutionary Party, and her involvement again led to her arrest and exile to Siberia (1910-17). Though she became known as the “little grandmother of the Revolution,” she opposed the Bolsheviks after their 1917 victory and emigrated to Prague.

Breslau See Wroclaw

Breslin, Jimmy orig. James Earl Breslin (b. Oct. 17, 1929, Jamaica, N.Y., U.S.) U.S. columnist and novelist. During his long newspaper career Breslin became known as a tough-talking voice of his native Queens, a working-class New York City borough. He started as a copyboy, then established himself as a sportswriter; later, as a syndicated columnist and contributor to numerous publications, he wrote with passion and personal involvement on politics and social issues, often focusing on injustice and corruption. He won a 1986 Pulitzer Prize for newspaper columns championing ordinary citizens. Among his books are the novel The Gang That Couldn’t Shoot Straight (1969).

Bresson, Henri Cartier- See Henri Cartier-Bresson

Bresson \br3-'so n \, Robert (b. Sept. 25, 1901, Bromont-Lamonthe, Puy-de Dome, France — d. Dec. 18, 1999) French film director. He worked as a painter and photographer before making his first film in 1934. His feature-length Les Anges du peche (1943) established his austere, intellectual style. Noted for intense psychological probing and the subordination of plot to visual imagery, he also directed The Diary of a Country Priest (1950), A Man Escaped (1956), Pickpocket (1959), Balthazar (1966), Lancelot of the Lake (1974), and L’ Argent (1983).

Brest-Litovsk Vbrest-li-'t6fsk\, Treaty of (March 3, 1918) Peace treaty signed at Brest-Litovsk (now in Belarus) by the Central Powers with Soviet Russia, concluding hostilities between those countries in World War I. Russia lost the Ukraine, its Polish and Baltic territories, and Finland by signing the treaty, which was later annulled by the Armistice.

Bretigny \bra-ten-'ye\. Treaty of (1360) Treaty between England and France that ended the first phase of the Hundred Years' War. Marking a serious setback for the French, the treaty was signed after Edward the Black Prince defeated and captured John II of France at the Battle of Poitiers

(1356). The French ceded extensive territories in northwestern France to England and agreed to ransom John at a cost of three million gold crowns, while King Edward III renounced his claim to the French throne. The treaty failed to establish a lasting peace, and the war began again in 1369.

Breton Xbrs-'touV Andre (b. Feb. 18, 1896, Tinchebray, France — d. Sept. 28, 1966, Paris) French writer, critic, and editor. In 1919 he helped found the Dada magazine Litterature. Influenced by psychiatry and the Symbolist movement, he wrote poetry using the automatic-writing technique. In 1924 his Manifeste du surrealisme provided a definition of Surrealism, of which he was the chief promoter. In the 1930s he joined and then broke with the Communist Party; in 1938 he founded the Federation de l'Art Revolutionnaire Independant with Leon Trotsky in Mexico. He spent World War II in the U.S. and returned to France in 1946. His Poemes appeared in 1948. He also wrote essays, works of criticism, and novels, including Nadja (1928).

Breton Vbre-t 3 n\ language Celtic language spoken in Brittany in France. It was introduced in the 5th-6th centuries by immigrants from southern Britain. Breton is attested in glosses in Latin manuscripts of the 8th- 10th centuries, but no continuous text is known before the 15th century. The modem language is divided into four groups of very diverse

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dialects; this disunity has hindered efforts to form orthographic and literary standards. Though Breton may have half a million speakers, use of the language is generally thought to be in sharp decline among younger people despite a resurgence of regional particularism in western Europe.

Bretton Woods Conference officially United Nations Monetary and Financial Conference (July 1-22, 1944) Meeting held at Bretton Woods, N.H., to make financial arrangements for the postwar era after the expected defeat of Germany and Japan. Representatives of 44 countries, including the Soviet Union, agreed to create the International Bank for Reconstruction and Development (World Bank) and the International Monetary Fund. See also John Maynard Keynes.

bretwalda \bret-'wal-d3\ or brytenwalda \ l bri-t3n-'wal-d3\ Any of several Anglo-Saxon kings with lordship over kingdoms beyond their own. Used in the Anglo-Saxon Chronicle, the title probably means "ruler of the Britons." It was given to Egbert (died 839) of Wessex and to seven earlier kings: Aelle of Sussex (fl. late 5th century), Ceawlin of Wessex (died 593), Aethelberht of Kent (died 616), Raedwald of East Anglia (died 616/27), Edwin of Northumbria (died 632), Oswald of Northumbria (died 641), and Oswiu of Northumbria (died 670).

Breuer Vbroi-orV Marcel (Lajos) (b. May 21, 1902, Pecs, Hung. — d. July 1, 1981, New York, N.Y., U.S.) Hungarian-U.S. architect and furniture designer. He studied and then taught at the Bauhaus (1920-28), where in 1925 he invented the famous tubular steel chair. He moved to Cam-

bridge, Mass., in 1937 to teach at Harvard University and practice with Walter Gropius. Their synthesis of Bauhaus internationalism with New England regional wood-frame building greatly influenced domestic architecture throughout the U.S. He was one of the most influential exponents of the International Style. His major architectural commissions include UNESCO's Paris headquarters (1953-58) and the Whitney Museum of American Art (1966).

Brewer, David J(osiah) (b. June 20, 1837, Smyrna, Ottoman Empire — d. March 28, 1910, Washington, D.C., U.S.) U.S. jurist. Born to U.S. missionaries, he grew up in Connecticut and practiced law in Kansas from 1858. He served in local judgeships (1861-70), on the state supreme court (1870-84), and on the federal circuit court. Appointed by Pres. Benjamin Harrison to the Supreme Court of the United States in 1889, he generally joined conservatives in resisting the trend toward increased federal power and responsibility. In 1895-97 he led the panel that settled the boundary dispute between Venezuela and British Guiana.

Brewster, William (b. 1567, England — d. April, 1644, Plymouth, Mass.) Anglo-American Puritan leader of Plymouth Colony in Massachusetts. He studied briefly at the University of Cambridge and became leader of a small Puritan congregation at Scrooby. Government persecution forced Brewster and his followers to emigrate to Holland in 1608, and he printed religious books in Leiden. In 1620 he joined the first group of Pilgrims aboard the Mayflower on the voyage to North America. When the colonists landed at Plymouth, Brewster became the senior elder of the colony, serving as its religious leader and as an adviser to Gov. William Bradford.

Breyer Vbrl-orN, Stephen (Gerald) (b. Aug. 15, 1938, San Francisco, Calif., U.S.) U.S. jurist. He received his law degree from Harvard Law School in 1964. After clerking for Arthur Goldberg (1964-65), he taught at Harvard (1967-81). He served as special counsel (1974-75) and chief counsel (1979-81) of the U.S. Senate Judiciary Committee before being appointed to the First U.S. Circuit Court of Appeals (1980); he became its chief judge in 1990. From 1985 to 1989 he served on the commission that devised guidelines for federal sentencing. He was nominated to the Supreme Court of the United States in 1994 by Pres. Bill Clinton. He was known as a pragmatic moderate acceptable to both Republicans and Democrats.

Brezhnev \'brezh-,nef\, Leonid (llich) (b. Dec. 19, 1906, Kamenskoye, Ukraine, Russian Empire — d. Nov. 10, 1982, Moscow, Russia, U.S.S.R.) Soviet leader. He worked as an engineer and director of a technical school in Ukraine and held local posts in the Communist Party, becoming regional party secretary in 1939. In World War II he was a political commissar in the Red Army and rose to major general (1943). In the 1950s he supported Nikita Khrushchev and became a member of the Politburo, though in 1964 he was the leader of a coalition that ousted Khrushchev, and soon he emerged as general secretary of the party (1966-82). He developed the Brezhnev Doctrine, which asserted the right of Soviet intervention in such Warsaw Pact countries as Czechoslovakia

(1968). In the 1970s he attempted to normalize relations with the West and to promote detente with the U.S. He was made marshal of the Soviet Union in 1976 and chairman of the Presidium of the Supreme Soviet in 1977, becoming the first to hold the leadership of both the party and the state. He greatly expanded the Soviet Union's military-industrial complex,

but in so doing he deprived the rest of the Soviet economy. Despite frail health, he retained his hold on power to the end.

Brian Boru Vbren-bo-'ruX (b. 941, near Killaloe, Ire. — d. April 23, 1014, Clontarf, near Dublin) High king of Ireland (1002-14). He became king of Munster in 976, won control of the southern half of Ireland from the high king Maelsechlainn in 997, and replaced him in 1002. Leinster and the Norsemen of Dublin united against him in 1013 with help from abroad; at the Battle of Clontarf, won by his son Murchad, Brian was killed in his tent by fleeing Norsemen (see Vikings). A line of princes, the O'Briens, descended from him.

Briand \bre-'a n \, Aristide (b. March 28, 1862, Nantes, France — d. March 7, 1932, Paris) French statesman. He became secretary-general of the French Socialist Party in 1901 and served in the Chamber of Deputies (1902-32). Between 1909 and 1929 he served 11 times as premier of France, and he held 26 ministerial posts between 1906 and 1932. His achievements included the Pact of Locarno and the Kellogg- Briand Pact. For his efforts for international cooperation, the League of Nations, and world peace, he shared the 1926 Nobel Prize for Peace with Gustav Stre-SEMANN.

bribery Crime of giving a benefit (e.g., money) in order to influence the judgment or conduct of a person in a position of trust (e.g., an official or witness). Accepting a bribe also constitutes a crime. Bribery is typically punishable as a felony (see felony and misdemeanour). In any charge of bribery, some element of "corrupt purpose" must be implied or proved. Thus, in the absence of a complete statutory prohibition on the granting of favours to a public official, a gift is not a bribe unless it is given with some intent to influence the recipient's official behaviour. See also extortion.

Brice, Fanny orig. Fannie Borach (b. Oct. 29, 1891, New York, N.Y., U.S.— d. May 29, 1951, Los Angeles, Calif.) U.S. comedian and singer. She played in vaudeville and burlesque shows, where the producer Florenz Ziegfeld discovered her in 1910. She became a headliner in his Follies with her musical numbers and comedy routines, including satiric sketches of ballet dancers and fan dancers as well as affecting torch songs such as "My Man." The character of Baby Snooks, an incorrigible little girl, which she created to amuse her friends, became a Follies favourite, and in that character Brice was featured on radio from 1936 until her death. The Broadway musical Funny Girl (1964; film, 1968) was based on her life.

brick Small building unit in the form of a rectangular block, first produced in a sun-dried form at least 6,000 years ago. Clay, the basic ingredient, is mined from open pits, formed, and then fired in a kiln to produce strength, hardness, and heat resistance. Brick was the chief building material in the ancient Near East. Its versatility was expanded in ancient Rome by improvements in manu-

facture and by new techniques of bonding. Brick came to be widely used in Western Europe for the protection it offered against fire. See also MASONRY, MORTAR.

Bricker, John W(illiam) (b. Sept. 6, 1893, Madison county, Ohio, U.S. — d. March 22, 1986, Columbus, Ohio) U.S. politician, governor of Ohio (1939^-5) and U.S. senator (1947-59). He graduated from Ohio State University (1916), then practiced law and later served as the state's attorney general (1933-37). Elected governor, he became the first Republican to win three consecutive terms. He was Thomas Dewey's running mate in the 1944 presidential race. As a U.S. senator, he led efforts to curb the president's power in foreign affairs. In 1953 he sponsored a constitutional amendment to limit U.S. participation in international treaties; opposed by John Foster Dulles, it was narrowly defeated.

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bridewealth Payment made by the groom or his kin to the kin of the wife in order to ratify the marriage. The practice is common in most parts of the globe in one form or another, but it is perhaps most prevalent in Africa. It is most often a matter of social and symbolic as well as economic reciprocity, being part of a long series of exchanges between the two intermarrying families. It represents a pledge that the wife will be well treated and serves as compensation for her family's loss. Payment may consist of goods or, less frequently, services, and it may be paid in one sum or regularly over a long period of time. See also dowry.

bridge Structure that spans horizontally to allow pedestrians and vehicles to cross a void. Bridge construction has always presented civil engineering with its greatest challenges. The simplest bridge is the beam (or girder) bridge, consisting of straight, rigid beams of steel or concrete placed across a span. Ancient Roman bridges are famous for their rounded arch form, which permitted spans much longer than those of stone beams and were more durable than wood. A modem version of the arch bridge might have a tmssed arch anchored to the abutments and a deck hanging from the arch by vertical cables. Suspension bridges (e.g., Brooklyn Bridge, Golden Gate Bridge) are capable of spanning great distances; their main support members are cables composed of thousands of strands of wire supported by two towers and anchored at each end, and the deck is suspended by vertical cables hung from the main cables. In cable-stayed bridges, cables fan out and down from a central tower to various points on the deck; variations of this design have resulted in bridges of striking design and very long span. Other bridges include the truss bridge, popular (e.g., for railroad bridges) because it uses a relatively small amount of material to carry large loads, and the cantilever bridge, typically made with three spans, with the outer spans anchored down at the shore and the central span resting on the cantilevered arms.

ARCH BRIDGE

pier trussed arch arch upper chord portal frame

BEAM BRIDGE

overpass continuous beam parapet

deck underpass pier

SUSPENSION BRIDGE

deck centre span tower abutment

Three common types of bridge design.

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bridge Card game similar to whist. Bridge is any one of several games, including games such as auction bridge and contract bridge, which retain the essential features of whist: Four players participate, two against two in partnership. They play with a 52-card pack, all cards of which are dealt face downward one at a time, clockwise. When play begins, the object is to win tricks, consisting of one card from each player in rotation. The players must, if able, contribute a card of the suit led, and the trick is won by the highest card. All tricks taken in excess of the first six tricks are known as odd tricks. Before play begins, a suit may be designated the trump suit, in which case any card in it beats any card of the other suits. In all types of bridge a certain number points are needed to win a game, and two games won by the same team allows them to win the rubber.

Bridgeport City (pop., 2000: 139,529), southwestern Connecticut, U.S. Located on Long Island Sound at the mouth of the Pequonnock River, it was settled in 1639. Its earlier names included Newfield and Stratfield; Bridgeport was chosen in 1 800. P.T. Barnum was once its mayor, and his star attraction “Tom Thumb” was bom there. The city evolved into an industrial centre following the arrival of the railroad in 1840. In the late 20th century, its industrial base eroded, causing financial problems for the city.

Bridger, Jim orig. James Bridger (b. March 17, 1804, Richmond, Va., U.S. — d. July 17, 1881, near Kansas City, Mo.) U.S. frontiersman. From 1822 he led fur-trapping expeditions to Utah and Idaho. He was apparently the first white man to visit the Great Salt Lake (1824) and among the first to explore Wyoming’s Yellowstone River region. In 1843 he established Fort Bridger, Wyo., as a fur-trading post on the Oregon Trail. After the 1850s he worked as a government scout. He became legendary for his knowledge of the territory and its Indian inhabitants.

Bridges, Calvin Blackman (b. Jan. 11, 1889, Schuyler Falls, N.Y.,

U.S. — d. Dec. 27, 1938, Los Angeles, Calif.) U.S. geneticist. He entered Columbia University in 1909 and assisted Thomas Hunt Morgan in designing experiments using Drosophila that showed that variations in the insect could be traced to observable changes in its genes. These experiments led to the construction of gene maps and proved the chromosome theory of heredity. In 1928 Bridges and Morgan moved to California Institute of Technology, where Bridges continued gene mapping and later discovered an important class of drosophila mutants caused by gene duplications.

Bridges, Harry orig. Alfred Bryant Renton (b. July 28, 1901, Kensington, near Melbourne, Vic., Austl. — d. March 30, 1990, San Francisco, Calif., U.S.) Australian-born U.S. labour leader. He arrived in the U.S. as a seaman in 1920, and he soon settled in San Francisco and became active in the local branch of the International Longshoremen's Association (ILA). In 1937 he led the Pacific Coast division out of the ILA and reconstituted it as the International Longshoremen's and Warehousemen's Union (ILWU), affiliated with the CIO (see AFL-CIO). His aggressive labour tactics and Communist Party connections led the CIO to expel the ILWU in 1950 during a purge of allegedly communist-dominated unions, and opponents tried unsuccessfully to have Bridges deported. He retired as president of the ILWU in 1977.

Bridges, Robert (Seymour)

(b. Oct. 23, 1844, Walmer, Kent, Eng. — d. April 21, 1930, Boar's Hill, Oxford) English poet. He published several long poems and poetic dramas, but his reputation rests on the lyrics collected in Shorter Poems (1890, 1894), which reveal his mastery of prosody. His 1916 edition of the poetry of his friend Gerard Manley Hopkins rescued it from obscurity. He was poet laureate of England from 1913 until his death.

Bridget, Saint (b. c. 1303, Swed. — d. July 23, 1373, Rome; canonized Oct. 8, 1391; feast day July 23) Mystic and patron saint of Sweden. She had religious visions from an early age but married and had eight children, including St. Catherine of Sweden. On the death of her husband (1344), she retired to

Robert Bridges, gold-point drawing by W. Strang; in the National Portrait Gallery, London

COURTESY OF THE NATIONAL PORTRAIT GALLERY, LONDON

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a life of prayer. She lived in Rome after 1350, striving to bring the pope back from Avignon. In response to a revelation, she founded a new religious order in 1370, the Brigittines. In 1372, inspired by another vision, she journeyed to the Holy Land and died soon after her return to Rome.

Bridgetown Capital (pop., 1990: 6,070) of Barbados, West Indies. Located on Carlisle Bay at the southwestern end of Barbados, it is the island's only port of entry. Founded in 1628, it was originally called Indian Bridge. The name St. Michael's Town came into favor c. 1660 and remained in use into the 19th century. The town was ravaged repeatedly by fires, and in 1854 a cholera epidemic killed some 20,000 people. Landmarks include St. Michael's Anglican Cathedral, built of coral rock. Economic mainstays include sugar refining, rum distilling, and tourism.

brier also spelled briar term generally applied to any plant with a woody and thorny or prickly stem, such as those of the genera Rosa, Rubus, Smilax, and Erica. White, or tree, heath {E. arborea) is found in southern France and the Mediterranean region. Its roots and knotted stems are used for making briarwood tobacco pipes. Its leaves are needlelike and its flowers almost white.

brig Two-masted sailing ship with square rigging on both masts. Brigs were both naval and mercantile vessels. As merchantmen, they often followed coastal trading routes, but ocean voyages were not uncommon, and some were even used for whaling and sealing. Naval brigs carried 10-20 guns on a single deck. In the 18th— 19th century, they served as couriers for battle fleets and as training vessels for cadets. Brigs of the early U.S. Navy won distinction on the Great Lakes in the War of 1812. Because square rigging required a large crew, merchant brigs became uneconomical, and in the 19th century they began to give way to vessels such as the schooner and the bark.

brigade \bri-'gad\ Military unit commanded by a brigadier general or a colonel and composed of two or more subordinate units, such as regiments or battalions. Two or more brigades make up a division.

Brigham \,brig-9m\ Young University Private university in Provo, Utah, U.S. Founded in 1875 by the Mormon church president Brigham Young, it continues to be supported by the Mormon church. It comprises nine colleges as well as schools of management and law. Important research facilities include laboratories for nuclear, plasma, and solid-state physics, aquatic ecology, and veterinary pathology and institutes for the study of food and agriculture and of computer-aided manufacturing.

Bright, John (b. Nov. 16, 1811, Rochdale, Lancashire, Eng. — d. March 27, 1889, Rochdale) British reform politician and orator. He entered Parliament in 1843 and served three times as a member of William E. Gladstone's cabinet. He was active in campaigns for free trade, lower grain

prices, and parliamentary reform. His Quaker beliefs shaped his politics, which consisted mainly of demands for an end to inequalities between individuals and between peoples. He denounced the Crimean War, supported the Reform Bill of 1 867, and was a cofounder (with Richard Cobden) of the Anti-Corn Law League.

Bright disease Type of nephritis without pus formation or edema. It may or may not recur. The acute stage involves severe inflammation and back pain, deficient kidney function, swelling, and hypertension. In the subacute stage the kidney enlarges, blood does not reach its surface and red blood cells are damaged (leading to anemia), and its tissue breaks down, releasing excess blood protein into urine. In the chronic stage a small, shriveled, scarred kidney cannot filter nitrogen compounds from the blood, causing uremia. Treatment focuses on symptom relief.

Brighton Town (pop., 1995 est.: 143,000), southern England. Lying on the English Channel south of London, it was for several centuries a small fishing village, but it gained popularity in the late 1 8th century when the prince of Wales (later George IV) made the first of his many visits. His powerful patronage stamped the town with the distinguished character still seen in its Regency-style squares. Victorian Brighton grew rapidly with the opening of the railway connecting it to London (1841).

Brigit Vbri-joA In Celtic religion, the goddess of poetry, crafts, prophecy, and divination. She was equivalent to the Roman Minerva and the Greek Athena and substantially the same as the northern British goddess Brigantia. In Ireland she was worshiped by the filid, a poetic and priestly class. She was one of three daughters of Dagda, all named Brigit, the others being associated with healing and the craft of the smith. Some of the lore surrounding Brigit was transferred to the 5th-century Irish abbess St.

Brigid. Her feast day, February 1 , is the date of the pagan festival Imbolc, when the ewes came into milk. Her great monastery at Kildare was probably founded on a pagan sanctuary, and many holy wells in the British Isles are dedicated to her.

Brillat-Savarin \bre-ya-sa-va-'ra n \, (Jean-) Anthelme (b. April 1, 1755, Belley, Fra. — d. Feb. 2, 1826, Paris) French lawyer and gastronome. Mayor of the town of Belley, he fled France during the Reign of Terror but returned to sit on France’s highest court, where he remained the rest of his life. His celebrated Physiologie du gout (“Physiology of Taste”; Eng. trans. A Handbook of Gastronomy), published in 1825, is less a treatise on cuisine than a witty compendium of anecdotes and observations intended to enhance the pleasures of the table; only the occasional recipe is included.

brine shrimp Any of several small crustaceans (genus Artemia) inhabiting brine pools and other highly salty inland waters throughout the world. A. salina, which occurs in vast numbers in Great Salt Lake,

Utah, is commercially important.

Young brine shrimp hatched there from dried eggs are used widely as food for fish and other small animals

in aquariums. Up to 0.6 in. (15 mm) long, the brine shrimp's body has a distinguishable head and a slender abdomen. It normally swims upside down, and it feeds primarily on green algae, which it filters from the water with its legs.

Brinkman, Johannes Andreas (b. March 22, 1902, Rotterdam, Neth. — d. May 6, 1949, Rotterdam) Dutch architect. After graduating from the Delft Technical University, he helped design the van Nelle tobacco factory (1928-30) in Rotterdam, one of the most architecturally important industrial buildings of the 1920s. An outstanding example of Modernist architecture, its unbroken expanses of glass convey a strong feeling of lightness and transparency.

Brisbane Ybriz-.banN City (pop., 2004 est.: urban agglom. 1,774,890), southeastern Queensland, Australia. Lying on the northern bank of the Brisbane River above its mouth at Moreton Bay, the site was first explored by the English in 1823. It was founded as a penal colony in 1824 and was declared a town in 1834 when it was named in honour of Sir Thomas Brisbane, former governor of New South Wales. Made the capital of Queensland in 1859, it was joined with South Brisbane in the 1920s to form Greater Brisbane. The city, connected by bridges and ferries, is Australia's third largest; it is the hub of rail lines and highways and a busy port. It is the site of the Queensland Cultural Centre and a university.

Brisbane, Albert (b. Aug. 22, 1809, Batavia, N.Y., U.S. — d. May 1, 1890, Richmond, Va.) U.S. social reformer. The son of wealthy landowners, he went to Europe in 1828 to study social reform with great thinkers of his age. Disappointed with Francois Guizot in Paris and G.W.F. Hegel in Berlin, he later discovered the works of Charles Fourier, under whom he studied for two years. In 1834 he returned to the U.S. and later established a Fourier community in New Jersey. His book Social Destiny of Man (1840) attracted widespread attention. In his newspaper column in the New York Tribune he explained the Fourier system of self-sustaining communities, which he called Associationism. His son Arthur (1 864—1936) was editor of the New York Evening Journal (1897-1921) and the Chicago Herald and Examiner (from 1918).

brise-soleil \,brez-so-'la\ (French: "breaks the sun") Sun baffle of vertical or horizontal louvers outside the windows or extending over the entire surface of a building's facade, especially precast concrete grids of the type developed by Le Corbusier. Many traditional methods exist for reducing the effects of the sun's glare, such as the projecting upper-story window of latticework (mashrabiyah or mushrabiyah) used in Islamic architecture, pierced screens as used at the Taj Mahal, or blinds of split bamboo (sudare) as used in Japan.

brisling See sprat

Brissot \bre-'so\ (de Warville), Jacques-Pierre (b. Jan. 15, 1754, Chartres, France — d. Oct. 31, 1793, Paris) French revolutionary politician. He founded the popular newspaper Le Patriote Frangais and became a leader of the Girondins (often called Brissotins) in the French Revolution. Elected to the Legislative Assembly in 1791, he advocated war against

Brine shrimp (Artemia salina)

DOUGLAS P. WILSON

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Austria, arguing that war would consolidate the Revolution. Along with other Girondins, he was arrested and guillotined during the Reign of Terror.

Bristol City and unitary authority (pop., 2001: 380,615), southwestern England. Lying at the confluence of the Rivers Avon and Frome, the city received its first charter in 1155. Long a centre of commerce, it was the point of departure in 1497 of John Cabot in his search for a route to Asia. During the 17th— 1 8th centuries it prospered in the triangular trade (rum, molasses, and slaves) between West Africa and the West Indian and American plantation colonies. Though Bristol suffered a decline in trade in the early 19th century, it soon rebounded with the coming of the railway. It suffered severe damage from bombing in World War II but was rebuilt. Today it is an important shipping centre, especially for oil and food products.

Bristol Channel Inlet of the Atlantic Ocean, southwestern England. It extends about 85 mi (135 km) between southern Wales and southwestern England, ranging from 5 to 43 mi (8-69 km) wide. Lundy Island, once a pirate stronghold, lies in the centre of the channel; it is maintained as a trust preserve. Ships using the English port of Bristol and the Welsh ports of Swansea and Cardiff pass through the channel.

Britain Name historically applied to the island of Great Britain. Britain is used especially when referring to its pre-Roman and Roman periods and to its early Anglo-Saxon period. It is the Anglicized form of Latin Britannia. See also United Kingdom.

Britain, Battle of (June 1940- April 1941) Series of intense raids directed against Britain by the German air force in World War II. The air attacks, intended to prepare the way for a German invasion, were directed against British ports and RAF bases. In September 1940 the attacks turned to London and other cities in a “blitz” of bombings for 57 consecutive nights, which was followed by intermittent raids until April 1941. The RAF was outnumbered but succeeded in blocking the German air force through superior tactics, advanced air defenses, and the penetration of German secret codes.

British Airways in full British Airways PLC International passenger airline based in London. In 1936 British Airways Ltd. was founded through the merger of three smaller airlines. A merger with Imperial Airways in 1939 created British Overseas Airways Corporation (BOAC). The British Airways name returned in 1974 with the government-mandated merger of BOAC and British European Airways (BEA). The airline was privatized in 1987. It merged with British Caledonian later that year. Brit-

ish Airways is one of Europe’s largest air carriers.

British American Tobacco PLC formerly British-American Tobacco Company Ltd. (1902-76) and B.A.T Industries PLC (1976-98) British conglomerate that is one of the world’s largest manufacturers of tobacco products. The company’s international headquarters are in London, while its chief American subsidiary, Brown & Williamson Tobacco Corporation, is headquartered in Louisville, Ky. Its acquisitions have included the American Tobacco Company (1994), which represents such cigarette brands as Pall Mall and Lucky Strike; Rothmans International (1999), known for its Dunhill and Rothmans brands; and Canada’s largest cigarette company, Imperial Tobacco (2000).

British Broadcasting Corp. See BBC

British Columbia Province (pop., 2003 est.: 4,146,600), western Canada. It is bounded by Yukon Territory, Northwest Territories, Alberta, the Pacific Ocean, and the U.S. (including Alaska). The province has an area of 364,764 sq mi (944,735 sq km), and its capital is Victoria. The area was inhabited by indigenous peoples, including Coast Salish, Nootka, Kwakiutl, and Haida. It was visited in 1578 by Sir Francis Drake and in 1778 by Capt. James Cook, who was searching for the Northwest Passage. Capt. George Vancouver surveyed the coast (1792-94), and overland expeditions were made by several explorers, including Alexander Mackenzie and Simon Fraser. The British and Americans contended over Vancouver Island for years, until it was recognized as British and made a crown colony in 1 849. The mainland became the colony of British Columbia in 1858; with the colony of Vancouver Island, it joined Canada in 1871 as the province of British Columbia. The province now has a prosperous economy based on diverse sources, including logging, mining, agriculture, and shipping.

British Columbia, University of Canadian public university in Vancouver. It is one of the largest universities in Canada and the oldest in the

province (founded 1908). It comprises faculties of agricultural sciences, applied science, arts, commerce and business administration, dentistry, education, forestry, graduate studies, law, medicine, pharmacy, theology, and science. Plant research is conducted at the UBC Botanical Garden, which is open to the public. The university has extensive study-abroad and continuing-education programs.

British Commonwealth See Commonwealth

British East Africa Territory under former British control, Africa. British penetration of the area began at Zanzibar in the late 19th century. In 1888 the British East Africa Co. established claims to territory in what is now Kenya. British protectorates were subsequently established over the sultanate of Zanzibar and the kingdom of B Uganda (see Uganda). In 1919 Britain was awarded the former German territory of Tanganyika as a League of Nations mandate. All these territories achieved political independence in the 1960s.

British Empire Worldwide system of dependencies — colonies, protectorates, and other territories — that over a span of three centuries came under the British government. Territorial acquisition began in the early 17th century with a group of settlements in North America and West Indian,

South Asian, and African trading posts founded by private individuals and trading companies. In the 18th century the British took Gibraltar, established colonies along the Atlantic seacoast of North America and in the Caribbean Sea, and began to add territory in India. With its victory in the French and Indian War (1763), the empire secured Canada and the eastern Mississippi Valley and gained supremacy in India. From the late 18th century it began to build power in Malaya and acquired the Cape of Good Hope, Ceylon (see Sri Lanka), and Malta. The British settled Australia in 1788 and subsequently New Zealand. Aden was secured in 1839, and Hong Kong in 1841. Britain went on to control the Suez Canal (1875-1956). In the 19th-century European partition of Africa, Britain acquired Nigeria, Egypt, the territories that would become British East Africa, and part of what would become the Union (later Republic) of South Africa. After World War I, Britain secured mandates to German East Africa, part of the Cameroons, part of Togo, German South-West Africa, Mesopotamia, Palestine, and part of the German Pacific islands. Britain gradually evolved a system of self-government for some colonies after the U.S. gained independence, as set forth in Lord Durham’s report of 1839. Dominion status was given to Canada (1 867), Australia (1 90 1), New Zealand (1 907), the Union of South Africa (1910), and the Irish Free State (1921). Britain declared war on Germany in 1914 on behalf of the entire empire; after World War I the dominions signed the peace treaties themselves and joined the League of Nations as independent states. In 1931 the Statute of Westminster recognized them as independent countries “within the British Empire,” referring to the “British Commonwealth of Nations,” and from 1949, the Commonwealth of Nations. The British Empire, therefore, developed into the Commonwealth in the mid-20th century, as former British dependencies obtained sovereignty but retained ties to the United Kingdom.

British Expeditionary Force (BEF) Home-based regular British army forces sent to northern France at the start of World Wars I and II to support the French armies. Britain wished to help France in case of a German attack, and the BEF was created in 1908 to ensure that British forces would be trained and ready to respond quickly. It consisted of six infantry divisions and one cavalry division. Five divisions sent to France at the outbreak of World War I sustained heavy losses and were succeeded by vast British armies. Divisions sent to France early in World War II (1939) returned to England when France fell the next year.

British Guiana See Guyana
British Honduras See Belize

British Invasion Musical movement. In the mid 1960s the popularity of a number of British rock-and-roll (“beat”) groups spread rapidly to the U.S., beginning with the triumphant arrival of Liverpool’s Beatles in New York in 1964 and continuing with the Rolling Stones, the Animals, and others. Building on 1950s U.S. models, these groups incorporated such local musical traditions as skiffle (acoustic drummerless ensembles), dancehall, and Celtic folk.

British Library National library of Great Britain, formed by the British Library Act (1972) and organized July 1, 1973. It consists of the former British Museum library, the National Central Library, the National Lending Library for Science and Technology, and the British National Bibliography. The British Museum library, founded in 1753 based on earlier col-

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lections and later increased by the addition of royal libraries, had the right to a free copy of all books published in the United Kingdom. Its collection included a rich series of charters (including those of the Anglo-Saxon kings), codices, psalters, and other papers ranging from the 3rd century bc to modern times. The present-day British Library receives a copy of every publication produced in the United Kingdom and Ireland.

British Museum Britain’s national museum of archaeology and antiquities, established in London in 1753 when the government purchased three large private collections consisting of books, manuscripts, prints, drawings, paintings, medals, coins, seals, cameos, and natural curiosities. In 1881 the natural -hi story collections were transferred to another building to form the Natural History Museum, and in 1973 the library collections were consolidated to form the British Library. Among the museum’s most famous holdings are the Elgin Marbles, the Rosetta Stone, the Portland Vase, and Chinese ceramics. In 1808 the department of prints and drawings opened with over 2,000 drawings. It is now one of the world’s largest and most comprehensive collections.

British North America Act (1867) Act of the British Parliament by which three British colonies — Nova Scotia, New Brunswick, and Canada — were united as “one Dominion under the name of Canada.” The act also divided the province of Canada into the provinces of Quebec and Ontario. It served as Canada’s “constitution” until 1982, when it became the basis of the Canada Act.

British Somaliland Former British protectorate, southern shore of the Gulf of Aden, eastern Africa. In the Middle Ages it was a powerful Arab sultanate; it was broken up in the 17th century. Its coast came under British influence in the early 19th century, but formal control was not acquired until it was taken from Egypt in 1884. It fell under Italian control in World War II. In 1960 it was united with the former Italian Somaliland to form Somalia. In 1991 a government opposition group declared the region comprising the former British Somaliland to be an independent state; however, it was not internationally recognized. See also Somaliland.

British Virgin Islands See British Virgin Islands

Brittany French Bretagne \'bro-'tan y \ Peninsula that forms a historical and governmental region, northwestern France. Known in ancient times as Armorica, it comprised the coastal area between the Seine and Loire rivers. Inhabited by Celts, it was conquered by Julius Caesar and organized as a Roman province. Invaded in the 5th century ad by Britons (Celtic people from Britain), the extreme northwestern part was thereafter called Brittany. Subdued by Clovis I, it was never effectively part of the Merovingian or Carolingian kingdom. France claimed Brittany in the 13th century, but it remained a separate state until the 15th century. It was formally incorporated into France in 1532 and had province status until the French Revolution. Roughly coextensive with but smaller than the historical region, the current administrative region of Brittany (pop., 2004 est.: 3,011,000) covers 10,505 sq mi (27,209 sq km). Its capital is Rennes.

It is an important agricultural region.

Britten of Aldeburgh, (Edward) Benjamin Britten, Baron (b.

Nov. 22, 1913, Lowestoft, Suffolk,

Eng. — d. Dec. 4, 1976, Aldeburgh,

Suffolk) British composer. He studied at the Royal College of Music, where he met the tenor Peter Pears (1910-86), who would become his lifelong companion. His auspicious Variations on a Theme of Frank Bridge (1937), for string orchestra, won him international acclaim. In 1945 his opera Peter Grimes established him as a leading opera composer. In 1948 he cofounded the Aldeburgh Festival, which became one of the most important English music festivals and the centre of Britten's musical activities. His operas include The Rape of Lucretia (1946), The Turn of the Screw (1954), and Death in Venice (1973); they are admired for their skillful setting of English words and their orchestral interludes, as well as for their dramatic aptness and depth of psychological characterization. His large

choral work War Requiem (1961) was greatly acclaimed. His best-known orchestral piece is The Young Person's Guide to the Orchestra (1946). In 1976 he became the first British composer in history to be ennobled.

Brno Vbsr-noX German Brunn VbruinX City (pop., 2001 prelim.: 379,185), southeastern Czech Republic. Located southeast of Prague, it lies in an area that shows evidence of prehistoric inhabitance and traces of Celtic and Slavic settlements in the 5th-6th centuries ad. German colonization in the 13th century stimulated its growth; it received city status in 1243. In various wars in the 15th— 19th centuries, it was besieged by the Swedes, Prussians, and French. Before World War I it was the capital of the Austrian crown land of Moravia. The inhabitants, predominantly German before World War II, are now mainly Czech. Gregor Mendel worked on his theory of heredity (1865) in the monastery at Brno.

broaching machine Machine tool, usually hydraulically operated, for finishing surfaces by drawing or pushing a cutter called a broach entirely over and past the surface. A broach has a series of cutting teeth arranged in a row or rows, graduated in height from the teeth that cut first to those that cut last. Each tooth removes only a few thousandths of an inch, and the total depth of cut is distributed over all the teeth. Broaching is particularly suitable for internal surfaces such as holes and internal gears, but it can also shape external gears and flat surfaces.

broad jump See long jump

broadband Term describing the radiation from a source that produces

a broad, continuous spectrum of frequencies (contrasted with a laser, which produces a single frequency or very narrow range of frequencies). A typical broadband-light source that can be used for either emission or absorption spectroscopy is a metal filament heated to a high temperature, such as a tungsten lightbulb. Sunlight is also broadband radiation. See also BROADBAND TECHNOLOGY.

broadband technology Telecommunications devices, lines, or technologies that allow communication over a wide band of frequencies, and especially over a range of frequencies divided into multiple independent channels for the simultaneous transmission of different signals. Broadband systems allow voice, data, and video to be broadcast over the same medium at the same time. They may also allow multiple data channels to be broadcast simultaneously.

broadcasting Transmission of sound or images by radio or television. After Guglielmo Marconi’s discovery of wireless broadcasting in 1901, radio broadcasting was undertaken by amateurs. The first U.S. commercial radio station, KDKA of Pittsburgh, began operation in 1920. The number of stations increased rapidly, as did the formation of national radio networks. To avoid radio monopolies, Congress passed the Radio Act of 1927, which created the Federal Communications Commission to oversee broadcast operations. In the 1930s and ’40s, the “golden age of radio,” innovations in broadcast techniques and programming made radio the most popular entertainment medium. Television broadcasting began in Germany and Britain in the 1930s. After World War II, the U.S. took the lead, and television stations soon overshadowed radio networks. Color television broadcasts began in 1954 and became widespread in the 1960s. By the 1980s, satellite transmission of live television further expanded the field of broadcasting. See also ABC, BBC, CBS, CNN, NBC, PBS.

Broadway Theatre district in New York City. It is named for the avenue that runs through the Times Square area in central Manhattan, where most of the larger theatres are located. Broadway attracted theatre producers and impresarios from the mid- 19th century. The number and size of the theatres grew with New York’s increasing prosperity, and by the 1890s the brightly lit street was called “the Great White Way.” By 1925, the height of theatrical activity in New York, about 80 theatres were located on or near Broadway; by 1980 only about 40 remained. In the 1990s the revitalization of the seedy Times Square neighbourhood attracted larger audiences, though high production costs limited the viability of serious plays in Broadway theatres, which often chose to mount big musicals and other crowd-pleasing commercial ventures. See also Off- Broadway.

Broca Vbro-koV Paul (b. June 28, 1824, Sainte-Foy-la-Grande, Fr. — d. July 9, 1880, Paris) French surgeon. His study of brain lesions contributed significantly to understanding of the origins of aphasia. Much of Broca’s research concerned the comparative study of the skulls of the races of humankind, work that aided the development of modern physical anthropology. He originated methods to study the brain’s form, structure, and surface features and sections of prehistoric skulls. His discovery

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(1861) of the brain’s speech centre (convolution of Broca) was the first anatomical proof of localization of brain function.

brocade Woven fabric having a raised floral or figured design that is introduced during the weaving process. The design, appearing only on the fabric face, is usually made in a satin or twill weave (see weaving).

The background may be twill, satin, or plain weave. The rich, fairly heavy fabric is frequently used for evening dresses, draperies, and upholstery.

broccoli Plant (. Brassica oleracea,

Botrytis group) closely related to cabbage in the mustard family. A fast-growing, upright, branched, annual plant, it bears dense green clusters of edible flower buds. Native to the eastern Mediterranean and Asia Minor, it was introduced to the U.S. probably in colonial times. Broccoli thrives in moderate to cool climates.

Its flavour resembles that of cabbage but is somewhat milder. It is one of the most broadly nutritious of all common vegetables.

Broch \'brok\, Hermann (b. Nov.

1, 1886, Vienna — d. May 30, 1951,

New Haven, Conn., U.S.) German writer. A student of physics, mathematics, and philosophy, Broch published his first major work. The Sleepwalkers (1931-32), when he was in his 40s. A trilogy tracing the disintegration of European society between 1888 and 1918, it exemplifies his innovative multidimensional novels in its use of many different narrative forms to present a wide range of experiences. His other novels include The Death of Virgil (1945), which presents the last 18 hours of Virgil’s life, and The Spell (1953), a portrayal of a Hitlerian stranger’s domination of a village. He also wrote essays, letters, and reviews.

Brocken Highest point in the Harz Mountains, central Germany. Its granite peak reaches 3,747 ft (1,142 m). When the sun is low, shadows from the peak become magnified, casting gigantic silhouettes on the upper surfaces of low-lying clouds or fog below the mountain. This effect, known as the Brocken bow or Brocken spectre, has mystical significance in the mountain’s folklore. Traditional rites enacted there on Walpurgis

Night became connected with the legend of Faust.

Brodsky, Joseph orig. losip Aleksandrovich Brodsky (b. May

24, 1940, Leningrad, Russia, U.S.S.R. — d. Jan. 28, 1996, New York, N.Y., U.S.) Russian-born U.S. poet. In the Soviet Union his independent spirit and irregular work record led to a five-year sentence to hard labour. Exiled in 1972, he settled in New York. He was poet laureate of the U.S. from 1991 to 1992. His lyric and elegiac poems ponder the universal concerns of life, death, and the meaning of existence. Brodsky's poetry collections include A Part of Speech (1980), History of the Twentieth Century (1986), and To Urania (1988). He was awarded the Nobel Prize for Literature in 1987.

Broglie \'broi\ family French noble family, descended from a Piedmontese family of the 17 th century, that produced many high-ranking soldiers, politicians, and diplomats. Prominent members included Frangois-Marie, 1st duke de Broglie (1671-1745), general and marshal of France; Victor-Frangois, 2nd duke de Broglie (1718-1814), a soldier and marshal of France; Victor, 3rd duke de Broglie (1785-1870), a prime minister who campaigned against reactionary forces; and Albert, 4th duke de Broglie (1821-1901), who served as premier in the early years of the French Third Republic. The family also included the physicist Louis-Victor, 7th duke de Broglie.

Broglie \'broi\, Louis-Victor (-Pierre-Raymond), duke de (b.

Aug. 15, 1892, Dieppe, France — d. March 19, 1987, Paris) French physicist. A descendant of the de Broglie family of diplomats and politicians, he was inspired to study atomic physics by the work of Max Planck and Albert Einstein. In his doctoral thesis he described his theory of electron waves,

then extended the wave-particle duality theory of light to matter. He is noted both for his discovery of the wave nature of electrons and for his research on quantum theory. Einstein built on de Broglie's idea of "matter- waves"; based on this work, Erwin Schrodinger constructed the system of wave mechanics. De Broglie remained at the Sorbonne after 1924 and taught theoretical physics at the Henri Poincare Institute (1928-62). He was awarded a Nobel Prize for Physics in 1929 and UNESCO's Kalinga Prize in 1952.

bromegrass Any of about 100 annual and perennial species of weeds and forage grasses that make up the genus Bromus, in the family Poaceae (Gramineae). Found in temperate and cool climates, bromegrasses have flat, thin leaves and open, spreading, erect or drooping flower clusters. More than 40 species are found in the U.S. ; about half are native grasses. Rescue grass (B . catharticus), a forage and pasture grass, and smooth brome (B . inermis), a forage plant and soil binder, are the economically important species. Downy brome or cheatgrass (B. tectorum), ripgut grass (B. diandrus), and foxtail brome (B . rubens) are dangerous to grazing animals; their spines can puncture the animals' eyes, mouths, and intestines, leading to infection and possible death.

bromeliad \br6-'me-le-,ad\ Any of the flowering plants of the order Bromeliales, containing a single family, Bromeliaceae, with almost 2,600 species. All but 1 species are native to the tropical New World and the West Indies. Bromeliad flowers have three parts, like lilies, but with contrasting sepals and petals. Many bromeliads are short-stemmed epiphytes.

Many species bear flowers in a long spike, with coloured bracts below or along the spike. Most have fleshy fruit, but some produce dry pods. Spanish moss and the edible fruit of the pineapple are the major economic products of the family. The leaves of some species contain fibres that are made into rope, fabric, and netting. The largest known bromeliad is the giant Puya raimondii of Peru and Bolivia, which may grow to more than 30 ft (9 m). Some species are cultivated indoors as ornamentals for their colourful flowers and foliage.

bromine Vbro-.menV Nonmetallic chemical element, chemical symbol Br, atomic number 35. One of the halogens, it is a deep red, fuming liquid at ordinary temperatures (freezing point 19 °F [-7.2 °C]; boiling point 138 °F [59 °C]) that contains diatomic molecules (Br 2), and it does not occur free in nature. It is obtained from seawater and brines or salt beds. Extremely irritating and toxic, bromine is a strong oxidizing agent (see oxidation -reduction). Its compounds, in which it may have valence 1, 3, 5, or 7, have many uses, including as petroleum additives (ethylene dibromide), in photographic emulsions (silver bromide), as sedatives, and in flour (potassium bromate).

bronchiectasis V.braq-ke-'ek-to-sosV Abnormal expansion of bronchi in the lungs. It usually results when preexisting lung disease causes bronchial inflammation and obstruction. Bronchial wall fibres degenerate, and bronchi become dilated or paralyzed, preventing removal of secretions, which stagnate. Infection spreads and intensifies. Evidence of the disease includes presence of infective agents, excess mucous secretions, and, in children, fatigue and growth retardation. Complications include recurrent pneumonia, lung abscesses, spitting up blood, and, in chronic cases, toe and finger clubbing. Treatment involves frequent, long-term drainage or (if the disease is on one side only) surgical removal of affected lung segments and antibiotics.

bronchitis \braq-'kl-t3s\ Inflammation in the bronchi of the lungs. Microbes and foreign matter that have entered the airways cause inflammation of the bronchi and stimulate excess secretion of mucus. Symptoms include a productive cough and a sensation of chest congestion. Long-term repetitive injury, as from smoking, may lead to chronic bronchitis, in which severe, irreversible damage leaves the lungs open to infection and fibrosis. Smoking-related chronic bronchitis often occurs in association with emphysema (together called chronic obstructive pulmonary disease). Treatment includes drugs to dilate the bronchi and promote coughing, antibiotics, and lifestyle adaptations (e.g., quitting smoking).

Bronte Vbran-te\ sisters Family of English writers. The daughters of an Anglican clergyman, they were brought up in Haworth on the Yorkshire moors. Their mother died early. Charlotte Bronte (April 21, 1816-March 31, 1855) attended the Clergy Daughter’s School with her sister Emily and subsequently taught school and served as a governess. She and Emily made an unsuccessful attempt to open a school. Her novel Jane Eyre (1847), an immediate success, was a powerful narrative of a woman in conflict with her natural desires and social situation that gave a new

Detail of handwoven Italian silk brocaded on silk with floral motif, c.

1 730-50.

COURTESY OF SCALAMANDRE, NEW YORK CITY

Broccoli (Brassica oleracea variety italica).

G.R. ROBERTS

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truthfulness to Victorian fiction. It was followed by the novels Shirley (1849) and Villette (1853). In 1854 she married her father’s curate, and she died soon after at age 38. Emily (Jane) Bronte (July 30, 1818-Dec. 19, 1848) was perhaps the greatest writer of the three. Poems by Currer, Ellis and Acton Bell (1846), published jointly by the sisters (who assumed pseudonyms to avoid the special treatment that they believed reviewers accorded to women), contained 21 of her poems. Many critics believe that her verse alone reveals poetic genius. Her one novel, Wuthering Heights (1847), is a highly imaginative story of passion and hatred set on the Yorkshire moors. Though not a success when published, it later came to be considered one of the finest novels in English. Soon after its publication, her health began to fail, and she died of tuberculosis at 30. Anne Bronte (Jan. 17, 1820-May 28, 1849) contributed 21 poems to Poems by Currer, Ellis and Acton Bell ; she wrote two novels, Agnes Grey (1847) and The Tenant ofWildfell Hall (1848). Anne died of tuberculosis at 29.

Brontosaurus See Apatosaurus

Bronx Borough (pop., 2000: 1,332,650), New York, New York, U.S. One of New York City’s five boroughs, it is the only mainland borough, and it is connected to Manhattan by a dozen bridges and railroad tunnels and to Queens by the Triborough, Bronx-Whitestone, and Throgs Neck bridges. The site was called Keskesbeck by the Indians who sold it in 1639 to the Dutch West India Company. The borough was a part of Westchester county until 1898, when it was incorporated into the city of New York. Though primarily residential, much of its more than 80 mi (130 km) of waterfront is used for shipping, warehouses, and industry. It is home to baseball’s Yankee Stadium. It has an extensive park system and includes the Bronx Zoo and the New York Botanical Gardens.

Bronx Zoo formally New York Zoological Park Zoo in New

York City. It opened in 1899 on 265 acres (107 hectares) in the northwestern area of the Bronx. In 1941 it added the 4-acre (1.6-hectare) African Plains, which features large groups of animals in natural surroundings. The zoo also includes the World of Darkness (the world’s first major exhibit of nocturnal animals, added in the 1960s), the World of Birds (a

huge, indoor free-flight exhibit), the Rare Animal Range (near-extinct species in natural settings), a Children's Zoo, Wild Asia (Asian mammals and birds), and the Congo Gorilla Forest. Managed by the New York Zoological Society and financed by the society and the city, it supports much research and oversees the Wildlife Survival Center on St. Catherine's Island, Georgia.

bronze Alloy traditionally composed of copper and tin. Bronze was first made before 3000 bc (see Bronze Age) and is still widely used, though iron often replaced bronze in tools and weapons after about 1000 bc because of iron's abundance compared to copper and tin. Bronze is harder than copper, more readily melted, and easier to cast. It is also harder than iron and far more resistant to corrosion. Bell metal (which produces pleasing sounds when struck) is bronze with 20-25% tin content. Statuary bronze, with less than 10% tin and an admixture of zinc and lead, is technically a brass. The addition of less than 1% phosphorus improves the hardness and strength of bronze; that formulation is used for pump plungers, valves, and bushings. Also useful in mechanical engineering are manganese bronzes, with little or no tin but considerable amounts of zinc and up to 4.5% manganese. Aluminum bronzes, containing up to 16% aluminum and small amounts of other metals such as iron or nickel, are especially strong and corrosion-resistant; they are cast or wrought into pipe fittings, pumps, gears, ship propellers, and turbine blades. Most "copper" coins are actually bronze, typically with about 4% tin and 1% zinc, or copper plating over base metal.

Bronze Age Third phase in the development of material culture among the ancient peoples of Europe, Asia, and the Middle East, following the Paleolithic and Neolithic periods and preceding the Iron Age. The term also denotes the first period in which metal was used. The date at which the age began varied by region; in Greece and China it began before 3000 bc, in Britain not until c. 1900 bc. The beginning of the period is sometimes called the Chalcolithic (Copper-Stone) Age, referring to the initial use of pure copper (along with its predecessor, stone). By 3000 bc the use of copper was well known in the Middle East, had extended westward into the Mediterranean area, and was beginning to infiltrate Europe. Only in the 2nd millennium bc did true bronze come to be widely used. The age was marked by increased specialization and the invention of the wheel and the ox-drawn plow. From c. 1000 bc the ability to heat and forge iron brought the Bronze Age to an end.

Bronzino Nbron-'dze-noV II orig. Agnolo di Cosimo (b. Nov. 17, 1503, Monticelli, duchy of Milan — d. Nov. 23, 1572, Florence)

Italian painter active in Florence. He was the student and adopted son of Jacopo da Pontormo. He excelled as a portraitist and was court painter to Cosimo I for most of his career. His portraits were emotionally inexpressive, but in their elegance and decorative qualities they embodied the courtly ideal under the Medici dukes.

His work influenced European court portraiture for the next century,

while his polished, sophisticated religious and mythological paintings epitomized the Mannerist style of his time (see Mannerism). In 1563 he became a founding member of the Accademia del Disegno.

brooch Ornamental pin with a clasp to attach it to a garment.

Brooches developed from the Greek and Roman fibula, which resembled a decorative safety pin and was used as a fastening for cloaks and tunics.

Brooches have been made in a wide variety of shapes throughout history, the ornamentation and design varying from region to region. In the 19th century, with the expansion of wealth and the creation of a market for inexpensive jewelry, the brooch became a popular form of personal decoration.

Brook, Sir Peter (Stephen Paul) (b. March 21, 1925, London, Eng.) British director and producer. After directing plays in Stratford-upon-Avon, he became director of the Royal Opera House, Covent Garden (1947-50). He directed several innovative Shakespearean productions that aroused controversy. Appointed codirector of the Royal Shakespeare Co. in 1962, he directed critically acclaimed productions of King Lear (1962) and A Midsummer Night's Dream (1970). He won international fame with his avant-garde direction of Peter Weiss's play Marat/Sade (1964). His films include Lord of the Flies (1962), King Lear (1969), and the six-hour Mahabharata (1989). In 1970 he cofounded, with Jean-Louis Barrault, the International Centre for Theatre Research.

Brook Farm (Institute of Agriculture and Education) Short-lived utopian experiment in communal living (1841 — 47) in West Roxbury, Mass, (near Boston), founded by George Ripley. The best known of the many utopian communities organized in the U.S. in the mid- 19th century. Brook Farm was to combine the thinker and the worker, to guarantee the greatest mental freedom, and to prepare a society of liberal, cultivated persons whose lives would be more wholesome and simpler than they could be amid the pressure of competitive institutions. It is remembered for the distinguished literary figures and intellectual leaders associated with it, including Charles A. Dana, Nathaniel Hawthorne, Margaret Fuller, Horace Greeley, James Russell Lowell, John Greenleaf Whittier, and Ralph Waldo Emerson (though not all of them were actual members). It was also noted for the modem educational theory of its excellent school. See also Oneida Community.

brook trout or speckled trout Popular freshwater game fish (Salve linus fontinalis), a variety of char, that is valued for its flavour and its fighting qualities when hooked. The brook trout is a native of the northeastern U.S. and Canada and has been transplanted to many parts of the world. It lives in cold, clean waters and carries dark, wormlike markings on the back and red and whitish spots on the body. The brook trout may weigh up to 6 lbs (3 kg). Some individuals migrate to large lakes or the sea and grow much larger and more silvery.

Brooke Raj (1841-1946) Dynasty of British rajas that ruled Sarawak

(now a state in Malaysia) for a century. Sir James Brooke (1803-68) served with the British East India Company and fought in the first Anglo-Burmese War (1824-26) before using his family fortune to outfit a schooner and sail for the Indies (1838). He was awarded the title of raja of Sarawak by the sultan of Brunei for helping suppress a rebellion. Brooke established a secure government on Sarawak and was succeeded by his

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"Portrait of a Young Man" (possibly Guidobaldo II, duke of Urbino), oil painting by ll Bronzino; in the Metropolitan Museum of Art, New York City.

THE METROPOLITAN MUSEUM OF ART, NEW YORK CITY, BEQUEST OF MRS. H.O. HAVEMEYER, 1 929, THE H.O. HAVEMEYER COLLECTION (29.100.16), COPYRIGHT 1981 BY THE METROPOLITAN MUSEUM OF ART

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nephew. Sir Charles Anthony Johnson Brooke (1829-1917), who had spent much of his life on Sarawak, knew the local language, and respected local beliefs and customs. Under him, social and economic changes were limited. His eldest son, Sir Charles Vyner de Windt Brooke (1874-1963), succeeded him and began a modernization program after World War I. He terminated Brooke rule in 1946, ceding Sarawak to Britain.

Brooke, Rupert (b. Aug. 3, 1887, Rugby, Warwickshire, Eng. — d. April 23, 1915, Skyros, Greece)

English poet. His best-known work, the sonnet sequence 1914 (1915), which includes the popular poem “The Soldier,” expresses an idealism in the face of death that is in strong contrast to later poetry of trench warfare. His death at age 27 in World War I contributed to his idealized image in the interwar period.

Brooklyn Borough (pop., 2000:

2,465,326), New York, New York, U.S. Separated from Manhattan by the East River, it is bordered to the south by the Atlantic Ocean. Brooklyn is connected to Manhattan by bridges (including the Brooklyn Bridge), a vehicular tunnel, and rapid transit services. The first settlement in the area by Dutch farmers in 1636 was soon followed by other villages, including Breuckelen (1645). The Battle of Long Island was fought in Brooklyn in 1776. It became a borough of New York City in 1898. Brooklyn is both residential and industrial and also handles considerable oceangoing traffic. Among its educational institutions is Pratt Institute. Coney Island is located there.

Brooklyn Bridge Suspension bridge built (1869-83) over the East River to link Brooklyn to Manhattan island. It was designed by the cable manufacturer John A. Roebung and his son Washington. A brilliant feat of 19th-century engineering, the bridge was the first to use steel for cable wire and the first in which explosives were used inside a pneumatic caisson during construction. In 1869 John was killed in one of at least 27 fatal construction accidents; his son saw the project to completion. The bridge's main span of 1,595 ft (486 m) was the longest in the world to date. It opened to such fanfare that within 24 hours an estimated quarter-million people crossed over it, using an elevated walkway designed to give pedestrians a dramatic view of the city.

Brooks Islands See Midway

Brooks Range Mountain range, northern Alaska, U.S. It extends about 600 mi (1,000 km) from Kotzebue Sound to the Canadian border. Its highest peak is Mount Isto, at 9,060 ft (2,760 m). Forming the northwestern end of the Rocky Mountains, it lies within Gates of the Arctic National Park. Huge reserves of oil were discovered at Prudhoe Bay, and the range is crossed at Atigun Pass by the Trans-Alaska Pipeline.

Brooks, Gwendolyn (Elizabeth) (b. June 7, 1917, Topeka, Kan., U.S. — d. Dec. 3, 2000, Chicago, 111.) U.S. poet. Reared in the Chicago slums, Brooks published her first poem at age 13. With Annie Allen (1949), a loosely connected series of poems about growing up in Chicago, she became the first black poet to win the Pulitzer Prize. The Bean Eaters (1960) contains some of her best verse. Among her other books are In the Mecca (1968), the autobiographical Report from Part One (1972), Primer for Blacks (1980), Young Poets' Primer (1981), and Children Coming Home (1991).

Brooks, James L. (b. May 9, 1940, Brooklyn, N.Y., U.S.) U.S. screenwriter, director, and producer. He worked in television from 1964. He cocreated and produced the hit Mary Tyler Moore Show (1970-77) and several other TV programs and series, including The Tracey Oilman Show (1986-90) and The Simpsons (from 1989). As writer, producer, and director of the film Terms of Endearment (1983), he won three Academy Awards; he also wrote, directed, and produced Broadcast News (1987) and As Good As It Gets (1997).

Brooks, Louise (b. Nov. 14, 1906, Cherryvale, Kan., U.S. — d. Aug. 8, 1985, Rochester, N.Y.) U.S. film actress. She danced in Florenz Ziegfeld's

Follies (1925) and soon gained a Hollywood contract. Noted for her mag-

netic screen presence and dark bobbed hair, she personified the 1920s flapper in the silent films A Girl in Every Port (1928) and Beggars of Life (1928). In Germany she gave legendary performances in G.W. Pabst's Pandora's Box (1928) and Diary of a Lost Girl (1929). Back in Hollywood (1930), however, she was offered only minor roles, and she retired in 1938 with little fame and no fortune. Her films were rediscovered in the 1950s, and her book Lulu in Hollywood (1982) won critical praise.

Brooks, Mel orig. Melvin Kaminsky (b. June 28, 1926, Brooklyn, N.Y., U.S.) U.S. director, producer, and actor. He wrote comedy routines for Sid Caesar's television shows (1949-59) and cocreated the TV series Get Smart (1965). He wrote and directed his first feature film, The Producers (1968, Academy Award for writing), which was later transformed into a hit Broadway musical. He directed, produced, and cowrote (and sometimes acted in) film comedies such as Blazing Saddles (1974), Young Frankenstein (1974), and Spaceballs (1987).

Brooks, Rodney Allen (b. Dec. 30, 1954, Adelaide, S.Aus., Austl.) Australian computer scientist. By the time he finished his doctorate (1981) at Stanford University, Calif., Brooks was disillusioned by the traditional "model-based" approach to artificial intelligence (AI). After moving to the Mobile Robotics Laboratory at MIT in 1984, he built simple robots that could perform "insectlike" actions on the premise that practical learning comes from interacting with the real world. In 1997 Brooks became director of the MIT AI Research Laboratory.

Brooks, Romaine Goddard orig. Beatrice Romaine Goddard (b. May 1, 1874, Rome, Italy — d. Dec. 7, 1970, Nice, Fr.) U.S. painter. Born to wealthy American parents, she studied painting in Italy. After a brief marriage, in 1905 she moved to Paris where she established herself in literary, artistic, and homosexual circles. Her reputation reached its height in 1925 with several important exhibitions. Her gray-shaded portraits, touched by occasional colour, distilled their subjects' personalities to a disturbing degree. The Amazon (c. 1920), Brooks's portrait of her longtime lover Natalie Clifford Barney (1876-1972), is among her finest works.

Brooks, Van Wyck (b. Feb. 16, 1886, Plainfield, N.J., U.S.— d. May 2, 1963, Bridgewater, Conn.) U.S. critic, biographer, and literary historian. Brooks attended Harvard University. His Finders and Makers series, tracing American literary history in rich biographical detail from 1 800 to 1915, includes The Flowering of New England, 1815-1865 (1936, Pulitzer Prize); New England: Indian Summer, 1865-1915 (1940); The World of Washington Irving (1944); The Times of Melville and Whitman (1947); and The Confident Years: 1885-1915 (1952).

broom In botany, any of several leguminous shrubs or small trees of the genus Cytisus, native to temperate regions of Europe and western Asia.

They are cultivated widely, chiefly for their attractive flowers. The compound leaves have three leaflets. The solitary or clustered yellow, purple, or white flowers resemble pea flow-

ers. The fruit is a flat pod. A common, almost leafless species is C. scoparius, a shrub with bright yellow flowers often grown for erosion control in warm climates. Butcher’s broom (Ruscus aculeatus) is a shrub of the lily family with small whitish flowers and red berries.

Brouwer \'brau-or\, Adriaen (b.

1605/06, Oudenaarde, Flanders— d.

January 1638, Antwerp) Flemish painter. After studying with Frans Hals in Haarlem c. 1623, he returned to Flanders and by 1631 had settled in Antwerp. His pictures, mostly small and painted on panels, typically depict peasants drinking and brawling in taverns. The coarseness of his subjects was in direct contrast to his delicate technique; his virtuoso brushwork and sparkling tonal values were unsurpassed. Brouwer popularized genre painting in Flanders and Holland. Adriaen van Ostade and David Teniers were among his many followers.

Browder, Earl (Russell) (b. May 20, 1891, Wichita, Kan., U.S. — d. June 27, 1973, Princeton, N.J.) U.S. Communist Party leader (1930-44). He was imprisoned in 1919-20 for his opposition to U.S. participation in

Rupert Brooke, posthumous portrait drawing by J.H. Thomas; in the National Portrait Gallery, London

COURTESY OF THE NATIONAL PORTRAIT GALLERY, LONDON

Broom (Cytisus beanii)

VALERIE FINNIS

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Brown, C. ► Brown, W. I 281

World War I. In 1921 he joined the U.S. Communist Party; he served as the party’s general secretary from 1930 to 1944 and was its presidential candidate in 1936 and 1940. In 1944 he was removed from his position for declaring that capitalism and socialism could coexist, and in 1946 he was expelled from the party.

Brown, Capability orig. Lancelot Brown (b. 1715, Kirkharle, Northumberland, Eng. — d. Feb. 6, 1783, London) British master of natu-

ralistic garden design. He worked for years at Stowe, Buckinghamshire, one of the most talked-of gardens of the day, under William Kent (1685–1748). By 1753 he was the leading “improver of grounds” in England. At Blenheim Palace he created masterly lakes and almost totally erased the earlier formal scheme. His landscapes consisted of expanses of grass, irregularly shaped bodies of water, and trees placed singly and in clumps. His style is often thought of as the antithesis of that of Andre Le Notre, designer of the formal Versailles gardens. Brown’s nickname arose from his habit of saying that a place had “capabilities.”

Brown, Charles Brockden (b. Jan. 17, 1771, Philadelphia, Pa., U.S. — d. Feb. 22, 1810, Philadelphia) U.S. writer. Brown left his law studies to devote himself to writing. His gothic novels in American settings were the first in a tradition later adapted by Edgar Allan Poe and Nathaniel Hawthorne. Wieland (1798), his best-known work, shows the ease with which mental balance is lost when common sense is confronted with the uncanny. His writings reflect a thoughtful liberalism while exploiting horror and terror. He has been called the “father of the American novel.”

Brown, Clifford (b. Oct. 30, 1930, Wilmington, Del., U.S. — d. June 26, 1956, Pennsylvania) U.S. jazz trumpeter. He became the most influential trumpeter of his generation, inspired by Fats Navarro to combine technical brilliance with lyrical grace in his playing. He was a principal figure in the hard-bop idiom (see bebop). After touring with Lionel Hampton’s big band in 1953, he worked with Art Blakey; in 1954 he and drummer Max Roach formed a quintet that became one of the outstanding groups in modem jazz. He died in a car crash at age 25.

Brown, Ford Madox (b. April 16, 1821, Calais, Fr. — d. Oct. 6, 1893, London, Eng.) British painter. He studied in Bruges, Antwerp, Paris, and Rome. In Italy (1845) he met Peter von Cornelius, a member of the Nazarenes, who influenced his palette and style. His use of brilliant colour, meticulous handling, and taste for literary subjects had a strong effect on the Pre-Raphaelites, most notably Dante Gabriel Rossetti. His most famous paintings are The Last of England (1852-55), a poignant tribute to emigration, and Work (1852-63), a Victorian social commentary. In 1861 he became a founding member of William Morris’s company, for which he designed stained glass and furniture.

Brown, George (b. Nov. 29, 1818, Edinburgh, Scot. — d. May. 9, 1880, Toronto, Ont., Can.) Canadian journalist and politician. He immigrated to New York in 1837 and in 1843 moved to Toronto, where he founded The Globe (1844), a reformist political newspaper. As a member of the Canadian assembly (1857-65), he advocated proportional representation, the confederation of British North America, acquisition of the Northwest Territories, and separation of church and state. He later became a leader of the Clear Grits movement. In 1873 he was appointed to the Canadian Senate, though he continued to manage his influential and popular newspaper (later The Globe and Mail).

Brown, James (b. May 3, 1933, Barnwell, S.C., U.S.) U.S. singer and songwriter. Growing up in Georgia during the Depression, Brown first sang and danced on street comers for money. He later formed a trio, appearing at small clubs throughout the South. He gradually evolved a highly personal style, combining blues and gospel music elements with his own emotionally charged and highly rhythmic delivery, accented by a strong sense of showmanship. His first hit, “Please, Please, Please”

(1956), was followed by other million-selling singles, including “Papa’s Got a Brand New Bag”; his style, marked by strong dance-oriented rhythms and heavy syncopation, became known as funk. His checkered personal life was highlighted in 1988 when he received a three-year jail sentence on a variety of charges.

Brown, Jim orig. James Nathaniel Brown (b. Feb. 17, 1936, St. Simons, Ga., U.S.) U.S. football player, often considered the greatest running back of all time. He was an All-American in football and lacrosse at Syracuse University. In his nine seasons with the Cleveland Browns (1957-65), he set NFL overall rushing and combined yardage records that stood until 1984. Averaging a record 5.22 yards per carry in his career. Brown led the NFL in rushing in eight of the nine years he played. After retiring from football, he became a movie actor.

Brown, John (b. 1735, Buncle, Berwickshire, Scot. — d. Oct. 17, 1788, London, Eng.) British physician. He propounded the “excitability” theory published in Elementa medicinae (1780), which classified diseases as over- or understimulating and held that internal and external “exciting powers,” or stimuli, operate on living tissues. Brown viewed diseases as states of decreased excitability, requiring stimulants, or increased excitability, requiring sedatives. Hermann von Helmholtz discredited the theory.

Brown, John (b. May 9, 1800, Torrington, Conn., U.S. — d. Dec. 2, 1859, Charles Town, Va.) U.S. abolitionist. He grew up in Ohio, where his mother died insane when he was eight. He moved around the country working in various trades and raised a large family of 20 children. Though he was white, he settled in 1849 with his family in a black community founded at North Elba, N.Y. An ardent advocate of overt action to end slavery, he traveled to Kansas in 1855 with five of his sons to retaliate against proslavery actions in Lawrence. He and his group murdered five proslavery settlers (see Bleeding Kansas). In 1858 he proposed to establish a mountain stronghold in Maryland for escaping slaves, to be financed by abolitionists. He hoped that taking the federal arsenal at Harpers Ferry, W.Va., would inspire slaves to join his “army of emancipation.” In 1859 his small force overpowered the arsenal’s guard; after two days it was in turn overpowered by federal forces led by Col. Robert E. Lee. Brown was tried for treason, convicted, and hanged. His raid made him a martyr to northern abolitionists and increased the sectional animosities that led to the American Civil War.

Brown, Joseph Rogers (b. Jan. 26, 1810, Warren, R.I., U.S. — d. July 23, 1876, Isles of Shoals, N.H.) U.S. inventor and manufacturer. He perfected and produced a highly accurate linear dividing engine in 1850, and then developed a vernier caliper and also applied vernier methods to the protractor. With Lucian Sharpe he founded the Brown and Sharpe Manufacturing Co. His micrometre caliper appeared in 1867. He invented a precision gear cutter to produce clock gears, a universal milling machine, and (perhaps his finest innovation) a universal grinding machine, in which articles were hardened first and then ground, thereby increasing accuracy and eliminating waste.

Brown, Molly orig. Margaret Tobin (b. July 18, 1867, Hannibal, Mo, U.S. — d. Oct. 26, 1932, New York, N.Y.) U.S. philanthropist, social reformer, and socialite. The daughter of Irish immigrants, she attended a grammar school and later worked at a tobacco factory. She followed her

brother c. 1884 to Colorado, where she met and married James Brown, a miner. After he found gold in 1894, they moved to Denver, where they were welcomed into society. She became a founding member of the Denver Woman's Club, part of a national network of women's clubs dedicated to improving the conditions of women and children. After her husband left her, she traveled to New York and Newport, where she enjoyed social success. As a passenger on the disastrous maiden voyage of the Titanic (1912), she helped command a lifeboat and was celebrated by the U.S. press as "the Unsinkable Mrs. Brown." Her life, in the semi-legendary form she herself recounted it, was popularized in a stage musical and movie.

Brown, Robert (b. Dec. 21, 1773, Montrose, Angus, Scot. — d. June 10, 1858, London, Eng.) Scottish botanist. The son of a clergyman, he studied medicine in Aberdeen and Edinburgh before entering the British army as an ensign and assistant surgeon (1795). He obtained the post of naturalist aboard a ship bound to survey the coasts of Australia (1801), and on the journey he gathered some 3,900 plant species. He published some of the results of his trip in 1810 in his classic Prodromus Florae Novae Hollandiae..., laying the foundations of Australian botany and refining prevailing plant classification systems. In 1827 he transferred Joseph Banks's botanical collection to the British Museum and became keeper of the museum's newly formed botanical department. The following year he published his observation of the phenomenon that came to be called Brownian motion. In 1831 he noted the existence in plant cells of what he called the nucleus. He was the first to recognize the distinction between gymnosperms and angiosperms (flowering plants).

Brown, William Wells (b. 1814?, near Lexington, Ky., U.S. — d. Nov. 6, 1884, Chelsea, Mass.) U.S. writer. Born into slavery, Brown escaped and educated himself, settling in the Boston area. He wrote a popular autobiography, Narrative of William W. Brown, A Fugitive Slave (1847),

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and lectured on abolitionism and temperance reform. Clotel (1853), his only novel, concerning the descendants of Thomas Jefferson and a slave, was the first novel ever published by an African American. His only play, The Escape (1858), is about two slaves who secretly marry.

brown bear Shaggy-haired, characteristically brown species (Ursus arctos) of bear with numerous races native to Eurasia and to northwestern North America. North American brown bears are usually called grizzly bears. Eurasian brown bears are generally solitary animals, able to run and swim well, and usually 48-84 in. (120-210 cm) long and 300-550 lbs (135-250 kg). They feed on mammals, fish, vegetable materials, and honey. The exceptionally large Siberian brown bear is similar in size to the grizzly.

brown dwarf Astronomical object intermediate in mass between a

planet and a star. Sometimes described as failed stars, brown dwarfs are believed to form in the same way as stars, from fragments of an interstellar cloud that contract into gravitationally bound objects. However, they do not have enough mass to produce the internal heat that in stars ignites hydrogen and establishes nuclear fusion. Though they generate some heat and light, they also cool rapidly and shrink; they may differ from high-mass planets only in how they form.

brown recluse spider Venomous species (Loxosceles reclusa) of brown spider, most common in the western and southern U.S. The brown recluse is light-coloured, generally with a dark violin-shaped design on its back, for which it is sometimes called the violin spider. About 0.25 in. (7 mm) long, it has a leg span of about 1 in. (2.5 cm). It has extended its range into parts of the northern U.S. and is often found under stones or in dark corners inside buildings. The venom of the brown recluse destroys the walls of blood vessels near the site of the bite, sometimes causing a slow-healing skin ulcer. Bites are occasionally fatal.

brown trout Prized and wary European game fish (Salmo trutta, family Salmonidae) that is favoured for food. The species includes several varieties (e.g., the Loch Leven trout of Britain). The brown trout is recognized by the light-ringed black spots on its brown body. It has been transplanted to many areas of the world because it can thrive in warmer waters than most other trout.

It grows to about 8 lbs (3.6 kg).

Oceangoing individuals, called sea trout, are larger than freshwater forms and provide good sport, as do those that enter large lakes.

Brown University Private university in Providence, Rhode Island, U.S., a traditional member of the Ivy League. It was founded in 1764 as Rhode Island College and renamed in 1804 for a benefactor, Nicholas Brown. It became coeducational in 1971 when it merged with Pembroke, a women’s college founded in 1891. Today it offers undergraduate and graduate degrees in all major academic fields; its school of medicine awards the M.D. Research facilities include centres for geological, astronomical, and educational research.

Brown v. Board of Education (of Topeka) (1954) U.S. Supreme Court case in which the court ruled unanimously that racial segregation in public schools violated the 14th Amendment to the U.S. Constitution. The amendment says that no state may deny equal protection of the laws to any person within its jurisdiction. The court declared separate educational facilities to be inherently unequal, thus reversing its 1 896 ruling in Plessy v. Ferguson. The Brown ruling was limited to public schools, but it was believed to imply that segregation is not permissible in other public facilities. Guidelines for ending segregation were presented and school boards were advised to proceed “with all deliberate speed.” See also Thurgood Marshall.

Browne, Sir Thomas (b. Oct. 19, 1605, London, Eng. — d. Oct. 19, 1682, Norwich, Norfolk) British physician and author. While practicing

medicine, he began a parallel career as a writer. His best-known work, Religio Medici (1642), is a journal of reflections on the mysteries of God, nature, and man. A larger work commonly known as Browne's Vulgar Errors (1646) attempted to correct popular beliefs and superstitions. He also wrote treatises on antiquarian subjects and the beautiful and subtle A Letter to a Friend (1690).

Brownian motion Any of various physical phenomena in which some quantity is constantly undergoing small, random fluctuations. It was named for Robert Brown, who was investigating the fertilization process of flowers in 1827 when he noticed a "rapid oscillatory motion" of microscopic particles within pollen grains suspended in water. He later discovered that similar motions could be seen in smoke or dust particles suspended in air and other fluids. The idea that molecules of a fluid are constantly in motion is a key part of the kinetic theory of gases, developed by James Clerk Maxwell, Ludwig Boltzmann, and Rudolf Clausius (1822-88) to explain heat phenomena.

Browning, Elizabeth Barrett orig. Elizabeth Barrett (b. March 6, 1806, near Durham, Durham,

Eng. — d. June 29, 1861, Florence)

British poet. Though she was an invalid who was afraid to meet strangers, her poetry became well known in literary circles with the publication of volumes of verse in 1838 and 1844. She met Robert Browning in 1 845 and, after a courtship kept secret from her despotic father, they married and settled in Florence. Her reputation rests chiefly on the love poems written during their courtship, Sonnets from the Portuguese (1850). Her most ambitious work, the blank-verse novel Aurora Leigh (1857), was a huge popular success.

Browning, Robert (b. May 7,

1812, London, Eng. — d. Dec. 12,

1889, Venice, Italy) British poet. His early works include verse dramas, notably Pippa Passes (1841), and long poems, including Sordello (1840). In the years of his marriage (1846-61) to Elizabeth Barrett Browning, spent in Italy, he produced little other than Men and Women (1855), which contains dramatic lyrics such as "Love Among the Ruins" and the great monologues "Fra Lippo Lippi" and "Bishop Blougram's Apology." Dramatis Personae (1864), including "Rabbi Ben Ezra" and "Caliban upon Setebos," finally won him popular recognition. The Ring and the Book (1868-69), a book-length poem, is based on a 1698 murder trial in Rome. Browning influenced many modern poets through his development of the dramatic monologue (with its emphasis on individual psychology) and through his success in writing

about the variety of modern life in language his contemporaries found often difficult as well as original.

Browning, Tod orig. Charles Albert Browning (b. July 12, 1880, Louisville, Ky., U.S. — d. Oct. 6, 1962, Malibu, Calif.) U.S. film director. He was a circus performer and vaudeville comic before joining the Biograph film studio in 1915. He wrote several screenplays, then directed melodramas and adventure films (1917-25). He directed the macabre film The Unholy Three (1925), starring Lon Chaney, followed by Dracula (1931) and Freaks (1932), which established his reputation for films of horror and the grotesque.

Brownshirts See SA

Brownsville Affair Racial incident in 1906 in Brownsville, Texas, involving white citizens of Brownsville and African American soldiers stationed at nearby Fort Brown. On the evening of August 13-14, rifle shots on a street in Brownsville killed one white man and wounded another. The mayor and other whites accused African American soldiers of the crime. Though their white officers stated that the soldiers were in their barracks, investigators accepted the mayor’s version, and Pres. Theodore Roosevelt ordered dishonourable discharges for 167 African American soldiers for their alleged conspiracy of silence. In 1972 a congressional investigation cleared the soldiers of guilt.

browser Software that allows a computer user to find and view information on the Internet. The first text-based browser for the World Wide Web became available in 1991 ; Web use expanded rapidly after the release in 1993 of a browser called Mosaic, which used “point-and-click” graphical manipulations. Such Web browsers interpret the HTML tags in downloaded documents and format the displayed data according to a set of

Brown trout (Salmo trutta)

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Elizabeth Barrett Browning, detail of an oil painting by Michele Gordigiani,

1 858; in the National Portrait Gallery, London.

COURTESY OF THE NATIONAL PORTRAIT GALLERY,

LONDON

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standard style rules. Netscape Navigator became the dominant Web browser soon after its release in 1994; Microsoft's Internet Explorer was introduced a year later and has become widespread.

Brubeck, Dave orig. David Warren Brubeck (b. Dec. 6, 1920, Concord, Calif., U.S.) U.S. jazz pianist and composer. Brubeck studied composition with Darius Milhaud before working as a jazz pianist. He formed a quartet with saxophonist Paul Desmond in 1951. His use of unconventional metres contributed to his immense appeal: the recording of Desmond's "Take Five" became the first jazz instrumental to sell more than a million copies. This exposure brought many new listeners to jazz, particularly on college campuses during the 1950s and '60s.

Bruce, Blanche K(elso) (b. March 1, 1841, Prince Edward county, Va., U.S. — d. March 17, 1898, Washington, D.C.) U.S. senator from Mississippi during Reconstruction. Bom to a slave mother and a white father, he was educated by his father. He moved to Mississippi, where he became a significant figure in state politics and purchased a plantation. In the U.S. Senate (1875-81), he advocated just treatment of African Americans and Indians and opposed the policy of excluding Chinese immigrants. He later served as register of the U.S. treasury (1881-85, 1895-98), District of Columbia recorder of deeds (1889-95), and trustee of Howard University.

Bruce, Lenny orig. Leonard Alfred Schneider (b. Oct. 13, 1925, Mineola, N.Y., U.S. — d. Aug. 3, 1966, Hollywood, Calif.) U.S. stand-up comedian. He studied acting and began performing stand-up routines in nightclubs in the 1950s, soon developing a style marked by black humour and punctuated with obscenity. As he gained notoriety, he focused his material on criticisms of the social and legal establishments, organized religion, and other controversial subjects. His reputation acquired iconic status as a daring performer and an activist for free speech after his death from a drug overdose.

brucellosis X.bru-so-'lo-sosV or Malta fever or Mediterranean fever or undulant fever Infectious disease of humans and domestic animals. It is characterized by gradual onset of fever, chills, sweats, weakness, and aches, and it usually ends within six months. It is named after the British physician David Bruce (b. 1855 — d. 1931), who first identified (1887) the causative bacteria. Three main species in the genus Brucella commonly cause the disease in humans, who contract it from infected animals (goats, sheep, pigs, cattle). Brucellosis is rarely transmitted between humans but spreads rapidly in animals, causing severe economic losses. Drug therapy is not practical for animal brucellosis, but vaccination of young animals is useful. Infected animals must be removed from herds. Antibiotics are effective against acute disease in humans, in whom it can cause liver and heart problems if untreated.

Bruch VbriikX, Max (Karl August) (b. Jan. 6, 1838, Cologne, Prussia — d. Oct. 2, 1920, Friedensau, near Berlin, Ger.) German composer. Bruch held many conducting positions and taught for 20 years at the Berlin Academy. He was known in his lifetime principally for his many sacred and secular choral pieces, including Odysseus (1872) and Das Lied von der Glocke (1879). Today he is remembered especially for

his first violin concerto (1868); he also wrote two further violin concertos, the cello variations Kol Nidrei (1881), and operas and symphonies.

Brucke VbriE-koV, Die German "The Bridge" Organization of German Expressionist artists. It was founded in 1905 by four architectural students at the Dresden Technical School, including Ernst Ludwig Kirchner and Karl Schmidt- Rottluff, who were soon joined by other German and European artists. Its name reflects their hope that their work would be a bridge to the art of the future. Strongly influenced by primitive art, German Gothic woodcuts, and the prints of Edvard Munch, they produced figure paintings and portraits depicting human suffering and anxiety, as well as still lifes and landscapes characterized by harshly distorted shapes and violent colours. They contributed to the 20th-century revival of the woodcut. The group disbanded in 1913. See photograph opposite.

Bruckner Vbruk-nsrV (Josef) Anton (b. Sept. 4, 1824, Ansfelden, Austria — d. Oct. 11, 1896, Vienna) Austrian composer. Son of a rural schoolmaster who died in Anton’s youth, he was taken into a monastery as a choirboy and there learned to play the organ. Greatly gifted, he became organist at Linz Cathedral in 1855; throughout his composing career, his orchestrations would be compared to organ sonorities. In 1865 he heard Tristan und Isolde in Munich and thereafter idolized Richard Wagner, though his own works remained indebted to Ludwig van

Beethoven. In 1868 he was appointed professor at the Vienna Conservatory and settled in Vienna for the rest of his life. He was 60 before he achieved fame with his Symphony No. 7 in E Major (1884). He was socially awkward and eccentric, and he remained a deeply devout Christian to his death. His reputation rests on his nine mature symphonies (1866-96), his three masses, and his Te Deum (1884).

Bruegel Vbroi-golV, Jan, the Elder (b. 1568, Brussels — d. Jan. 13, 1625, Antwerp) Flemish painter and draftsman, second son of Pieter Bruegel. Early in his career he went to Italy, where he painted under the patronage of Cardinal Federigo Borromeo. After returning to Antwerp in 1596, he enjoyed a highly successful and prestigious career. In 1608 he was appointed court painter to the archdukes of Habsburg, regents of the southern Netherlands. He is known for his small-scale landscapes and exquisite flower paintings, all painted in a miniaturistic style on copper or panel. His skill at depicting delicate textures earned him the nickname “Velvet.” He often collaborated with other artists, including his friend Peter Paul Rubens. His sons, Jan the Younger and Ambrosius, were also painters.

Bruegel Vbroi-golV Pieter, the Elder (b. c. 1525, probably Breda, duchy of Brabant — d. Sept. 5/9, 1569, Brussels) Greatest Netherlandish painter of the 16th century. Not much is known of his early life, but in 1551 he set off for Italy, where he produced his earliest signed painting, Landscape with Christ and the Apostles at the Sea of Tiberias (c. 1553). Returning to Flanders in 1555, he achieved some fame with a series of satirical, moralizing prints in the style of Hieronymus Bosch, commissioned by an Antwerp engraver. He is best known for his paintings of Netherlandish proverbs, seasonal landscapes, and realistic views of peasant life and folklore, but he also took a novel approach to religious subject matter, portraying biblical events in panoramic scenes, often viewed from above. He had many important patrons; most of his paintings were commissioned by collectors. In addition to many drawings and engravings,

about 40 authenticated paintings from his enormous output have survived. His sons, Peter Brueghel the Younger and Jan, the Elder Brueghel (both of whom restored to the name the h their father had abandoned), and later imitators carried his style into the 18th century.

Brugge Vbrui-koA English Vbru-g9\ or Bruges \'briezh\ City (pop., 2000 est.: 1 16,200), northwestern Belgium. First mentioned in 7th-century records, it was the site of a castle built in the 9th century by the first counts of Flanders against Norman invaders. It joined the Hanseatic League and was a major marketplace in the 13th century. As the centre of the Flemish cloth industry, it was the commercial hub of northern Europe. In the 15th century it was home to Jan van Eyck and other painters of the Flem-

"Dodo and Her Brother/' oil painting by Die Brucke artist Ernst Ludwig Kirchner, c. 1 908; in the Smith College Museum of Art, Northampton, Mass.

COURTESY OF THE SMITH COLLEGE MUSEUM OF ART, NORTHAMPTON, MASS.

ish school (see Flemish art). It declined as a port and textile centre but later revived with the construction of canals linking it with the North Sea. Shipbuilding, food processing, chemicals, electronics, and tourism are the main industries.

Brugghen, Hendrik ter See

Hendrik Terbrugghen

Brugmann Vbrug-.manV

(Friedrich) Karl (b. March 16, 1849, Wiesbaden, Nassau — d. June 29, 1919, Leipzig, Ger.) German linguist. A professor of Sanskrit and comparative linguistics, he belonged to the Neogrammarian school, which asserted the inviolability of phonetic laws and adhered to strict research methodology. Among the best known of his 400 publications are the two volumes on sounds and forms that he contributed to the Outline of the Comparative Grammar of the Indo-Germanic Languages (1886-93).

Bruhn VbriinV, Erik orig. Belton Evers (b. Oct. 3, 1928, Copenhagen, Den. — d. April 1, 1986, Tor-

onto, Ont., Can.) Danish ballet

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dancer. From 1937 he studied at the Royal Danish Ballet training school, and in 1947 he joined the company. He performed as guest soloist with many other companies, including American Ballet Theatre in the 1950s and ’60s, dancing leading roles in such ballets as La Sylphide, Swan Lake , and Carmen. He was admired for his classical technique. He later served as director of the Royal Swedish Opera House (1967-72) and assistant director (1973—81) and director (1983-86) of Canada’s National Ballet.

bruise or contusion Visible bluish or purplish mark beneath the surface of unbroken skin, indicating burst blood vessels in deeper tissue layers. Bruises are usually caused by a blow or pressure, but they may occur spontaneously in elderly persons. The yellowish hue that becomes visible as a bruise heals comes from the disintegration and gradual absorption of blood.

Bruhn as Romeo, 1 967

FRED FEHL

Brumaire ybrui-'merV Coup of 18-19 (1799) French coup d’etat that overthrew the Directory and substituted the Consulate, making way for the despotism of Napoleon. Planned by Emmanuel Joseph Sieyes and Charles Maurice de Talleyrand with the aid of Napoleon, the coup took place on November 9-10 (18-19 Brumaire in the French republican calendar). It is often considered the effective end of the French Revolution.

Brummell, Beau orig. George Bryan (b. June 7, 1778, London, Eng. — d. March 30, 1840, Caen,

France) English dandy. The son of Lord North’s private secretary, he attended Oxford and became famous for his dress and wit as well as for his friendship with George, prince of Wales (later King George IV). The leader of English fashion of his time, he had by 1816 exhausted his inherited fortune on gambling and extravagance, and his sharp tongue had alienated his patron. He fled to Calais, France to avoid his creditors and struggled for 14 years before becoming British consul at Caen (1830-32). In 1835 his friends rescued him from debtor’s prison, but he soon lost all interest in his personal appearance, and he spent his final years in a charitable asylum.

Brun, Charles Le See Charles Le Brun

Beau Brummell, engraving by John Cooke after a portrait miniature, 1 844.

Brundage, Avery (b. Sept. 28, 1887, Detroit, Mich., U.S. — d. May 8, 1975, Garmisch-Partenkirchen, W.Ger.) U.S. sports administrator. He competed in the decathlon at the 1912 Olympic Games. He served as president of the U.S. Olympic Association and Committee 1929-53 and as vice president (1945-52) and president (1952-72) of the International Olympic Committee. Controversial and domineering, he demanded strict adherence to the rules of amateur competition, and he often dismissed political events as unrelated to Olympic competition, most notably the 1972 murder of Israeli athletes by terrorists.

Brundtland Vbrunt-land\, Gro Harlem orig. Gro Harlem (b.

April 20, 1939, Oslo, Nor.) Norwegian politician, first woman prime minister of Norway (1981, 1986-89, 1990-96). Trained as a physician, she worked with various government health services, then served as minister of the environment (1974-79). She served in the Norwegian parliament (1977-97). As leader of the Labour Party group, she served as premier three times. In 1987 she chaired the UN World Commission on Environment and Development, and in 1998 she was elected director-general of the World Health Organization.

Brunei \bru-'n!\ officially State of Brunei, Abode of Peace Independent sultanate, northern Borneo, western Pacific Ocean. The country is divided into two parts, each surrounded by the Malaysian state of

Sarawak; they both have coastlines on the South China Sea and Brunei Bay. Area:

2,226 sq mi (5,765 sq km). Population (2005 est.): 364,000. Capital: Bandar Seri Begawan. Brunei has a mixture of Southeast Asian ethnic groups: about two-thirds are Malay, one-tenth Chinese, and the remainder indigenous peoples and Indians. Languages: Malay (official), English (widely understood). Religions: Islam (official; predominantly Sunni); also traditional beliefs, Buddhism, Christianity. Currency: Brunei dollar, ringgit. The narrow northern coastal plain gives way to rugged hills in the south. Brunei's western enclave consists of the valleys of the Belait, Tutong, and Brunei rivers and is mainly hilly. The eastern enclave contains the Pandaruan and Temburong river basins and the country's highest point, Pagon Peak (6,070 ft [1,850 m]). Much of Brunei is covered by dense tropical rainforest; very little land is arable. Its economy is dominated by production from major oil and natural gas fields. It has one of the highest per capita incomes in Asia. Brunei is a monarchy; the head of state and government is the sultan. Brunei traded with China in the 6th century ad. Through allegiance to the Javanese MajapAHlT kingdom (13th– 15th century), it came under Hindu influence. In the early 15th century, with the decline of the Majapahit kingdom, many converted to Islam, and Brunei became an independent sultanate. When Ferdinand Magellan's ships visited in 1521, the sultan of Brunei controlled almost all of Borneo and its neighbouring islands. In the late 16th century Brunei lost power because of the Portuguese and Dutch activities in the region; they were soon joined by the British. By the 19th century the sultanate of Brunei included Sarawak (including present-day Brunei) and part of North Borneo (now part of Sabah). In 1841 a revolt took place against the sultan, and a British soldier, James Brooke, helped put it down; he was later proclaimed governor (see Brooke Raj). In 1847 the sultanate entered into a treaty with Great Britain, and by 1906 it had yielded all administration to a British resident. Brunei rejected membership in the Federation of Malaysia in 1963, negotiated a new treaty with Britain in 1979, and achieved independence in 1984, with membership in the Commonwealth. Brunei has pursued ways to diversify the economy, notably by encouraging tourism.

Brunei See Bandar Seri Begawan

Brunei \bru-'nel\, Isambard Kingdom (b. April 9, 1806, Portsmouth, Hampshire, Eng. – d. Sept. 15, 1859, London) British civil and mechanical engineer. He was the son of Marc Brunel. His introduction of the broad-gauge railway, with rails 7 ft (2 m) apart, made possible high

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speeds and provided a great stimulus to railroad progress. He was responsible for building more than 1,000 mi (1,600 km) of railway in Britain and also oversaw construction of railway lines in Italy, Australia, and India. His use of a compressed-air caisson to sink bridge pier foundations helped gain acceptance of compressed-air techniques in underwater and

underground construction. Brunei made outstanding contributions to marine engineering with three steamships — the Great Western, the Great Britain, and the Great Eastern — each the largest in the world at date of launching. The Great Western instituted the first regular transatlantic service, and Great Eastern laid the first successful transatlantic cable.

Brunei, Sir Marc (Isambard) (b. April 25, 1769, Hacqueville, France — d. Dec. 12, 1849, London, Eng.) French-born British engineer and inventor. He perfected a method for making ships' blocks (pulleys) by mechanical means rather than by hand; the system of 43 machines, run by 10 men, produced blocks superior in quality and consistency to those previously handmade by more than 100 men. This installation was an early example of completely mechanized production (see mechanization). In 1 8 1 8 he patented the tunneling shield, a device that made safe tunneling through water-bearing strata possible. In 1825 operations began for building the Brunei-designed tunnel under the River Thames, an unprecedented feat completed in 1842. He was the father of I.K. Brunel.

Brunelleschi V.bru-n^-'es-keV, Filippo (b. 1377, Florence [Italy] — d. April 15, 1446, Florence) Florentine architect and engineer. Trained as a sculptor and goldsmith, he turned his attention to architecture after failing to win a competition for the bronze doors of the Baptistery of Florence, having tied with Lorenzo Ghiberti. He worked out the laws of linear perspective (later codified by Leon Battista Alberti). By the early 1420s Brunelleschi was Florence's most prominent architect. His major work, the octagonal dome of the cathedral (1420-36), was constructed with the aid of machines of his own invention. The Medici family commissioned him to design the (old) sacristy and basilica of San Lorenzo (begun 1421), considered keystones of the early Renaissance; he adhered to the conventional format while adding his own interpretation of antique designs for capitals, friezes, pilasters, and columns. His later monumental works foreshadowed the strong profiles and massive grandeur of the work of Alberti and Donato Bramante.

Brunhild Vbrun-.hildX (b. c. 534 — d. 613, Reneve, Burgundy) Queen of the Frankish kingdom of Austrasia. Daughter of a king of the Visigoths, she married the Austrasian king Sigebert I in 567. One of the most forceful monarchs of the Merovingians, she urged Sigebert to reclaim her murdered sister's lands from Chilperic I. When her husband was assassinated in 575, Brunhild was imprisoned at Rouen. She later took refuge at Metz, where her son Childebert II had been proclaimed king, and she struggled to establish her authority over her son and the reluctant Austrasian magnates. After Childebert' s death she continued to influence affairs and impose her will on her grandsons. After a long career she fell into the hands of her enemies, including the founders of the Carolingian family; she was tortured and then dragged to death by a horse.

Brunhild or Brunhilda or Brynhild Beautiful Amazon-like heroine of ancient Germanic literature. She is known from Old Norse sources, notably the Edda poems and the Vqlsunga saga, and from the German Nibelungenlied. She also appears in the operas of Richard Wagner's Ring cycle. She vowed to wed only a man of the most outstanding qualities who could surpass her in strength. She was successfully wooed by King Gunther, who defeated her in a contest in which the deeds were actually performed by Siegfried in cloak of invisibility. When she later discovered that she had been deceived, she exacted vengeance, and Siegfried was killed. Siegfried's widow in turn sought revenge and brought about the destruction of Gunther's people, the Burgundians. In some Norse sources, Brunhild has supernatural qualities and is described as a Valkyrie.

Bruning Vbrui-niqV Heinrich (b. Nov. 26, 1885, Munster, Ger. — d. March 30, 1970, Norwich, Vt., U.S.) German politician. Elected to the Reichstag in 1924, he became noted as a financial expert. Leader of the Catholic Centre Party from 1929, he became chancellor of Germany in 1930. In response to the Great Depression, he instituted harsh austerity measures that paralyzed the German economy. He ignored the Reichstag and governed by presidential decree, which hastened the drift toward rightist dictatorship and Adolf Hitler's rise to power. Forced to resign in 1932, he left Germany in 1934 and eventually moved to the U.S. , where he taught at Harvard University (1937-52).

Brunn See Brno

Brunner Vbrun-orV (Heinrich) Emil (b. Dec. 23, 1889, Winterthur, Switz. — d. April 6, 1966, Zurich) Swiss Reformed theologian. After serving as a pastor at Obstalden (1916-24), he taught for many years at the University of Zurich (1924-53); he lectured widely during this time and was a delegate to the founding session of the World Council of Churches in 1948. His theology was influenced by Martin Buber's view of the relationship between God and man. Like Karl Barth, he rejected 19th-century liberal theology in favour of reaffirming the central tenets of the Reformation, but his assertion that God was revealed in creation led to a dispute with Barth. His works include The Theology of Crisis (1929), Man in Revolt (1937), and Justice and the Social Order (1945).

Bruno of Querfurt \'kfer- 1 furt\ / Saint or Saint Boniface of Querfurt (b. c. 974, Querfurt, Saxony — d. March 14, 1009, near Braunsberg, Prussia; feast day June 19) Missionary and martyr. A member of a noble family, he was attached to the clerical household of the emperor Otto III. After the martyrdom of St. Adalbert (997), Bruno entered a monastery, taking the name Boniface, and continued Adalbert's work in Christianizing the pagan Prussians. The members of a mission he sent to Poland, including Saints Benedict and John, were killed en route; Bruno wrote biographies of both saints, as well as an acclaimed biography of Adalbert. As archbishop, Bruno visited the rulers of Germany, Hungary, and Ukraine, seeking aid. He temporarily converted the pagan Pechenegs. He was killed on his way to his Prussian mission.

Bruno, Giordano orig. Filippo Bruno (b. 1548, Nola, near Naples — d. Feb. 17, 1600, Rome) Italian philosopher, astronomer, mathematician, and occultist. He entered a Dominican convent in 1565 and was ordained a priest in 1572. He abandoned the order in 1576 after being accused of heresy. He moved to Geneva in 1578 and thereafter traveled

Europe as a lecturer and teacher. Rejecting the traditional geocentric astronomy for a theory even more radical than that of Copernicus, he hypothesized an infinite universe and multiple worlds. His cosmological theories, which anticipated fundamental aspects of the modern conception of the universe, led to his excommunication by the Roman Catholic, Calvinist, and Lutheran churches. In 1592 he was arrested and tried by the Venetian Inquisition, which extradited him to the Roman Inquisition in the following year. After a seven-year trial, he was burned at the stake. His ethical ideas have appealed to modem humanists, and his ideal of religious and philosophical tolerance has influenced liberal thinkers. His most important works are On the Infinite Universe and Worlds (1584) and The Expulsion of the Triumphant Beast (1584).

Brusa See Bursa

Brusilov \bru-'sye-lof\, Aleksey (Alekseyevich) (b. Aug. 31, 1853, Tiflis, Russia — d. March 17, 1926, Moscow, Russia, U.S.S.R.) Russian general. He distinguished himself in the Russo-Turkish War (1 877—78) and was promoted to general in 1906. In World War I he led the Russian campaign in Galicia (1914) and was most famous as commander of the “Brusilov breakthrough” on the Eastern Front against Austria-Hungary (1916), inflicting losses that forced Germany to divert troops from the Battle of Verdun against France on the Western Front. He later served in the Bolshevik government as a military consultant (1920-24).

Brussels French Bruxelles \bruj-'sel, briek-'selV Flemish Brussel VbriE-solX City (pop., 2000 est.: 133,900), capital of Belgium. Part of the Brussels Capital Region (pop., 2000 est.: 959,300), one of the three regions into which Belgium is divided, it lies on the Senne River, a tributary of the Schelde. The village began on an island in the Senne and ultimately became a holding of the dukes of Brabant. In 1530 it became the capital of the Netherlands, which was then under Habsburg control. Part of the Kingdom of the Netherlands from 1815, it became a centre of Bel-

Interior of Santo Spirito, Florence,
designed by Filippo Brunelleschi,
begun 1436

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gian rebellion in 1830 and then the capital of Belgium. An important industrial and commercial city, it is the headquarters of both NATO and the European Union.

Brussels sprout Small CABBAGE-related plant (Brassica oleracea, Gemmifera group). A member of the mustard family, Brussels sprouts are widely grown in Europe and the U.S. In early stages of growth, the plant closely resembles the common cabbage, but the main stem grows to a height of 2-3 ft (60-90 cm) and the axillary buds along the stem develop into small heads (sprouts) similar to heads of cabbage but measuring only 1—1.6 in. (25-40 mm) in diameter. The plant requires a mild, cool climate and is harmed by hot weather. Highly nutritious, Brussels sprouts are a particularly good source of vitamins A and C.

Brussels Treaty (1948) Agreement signed by Britain, France, Belgium, the Netherlands, and Luxembourg, creating a collective-defense alliance. It led to the formation of NATO and the Western European Union. A goal of the treaty was to show that Western European states could cooperate, thus encouraging the U.S. to play a role in the security of Western Europe.

Brutalism or New Brutalism Term coined (1953) to describe Le Corbusier’s use of monumental, sculptural shapes and raw, unfinished molded concrete, an approach that represented a departure from International Style. New Brutalist architects displayed a willful avoidance of polish and elegance in their buildings, exposing such structural elements as steel beams and precast concrete slabs to convey a stark, austere rectilinearity. See also Louis Kahn, James Stirling.

Brutus, Marcus Junius or Quintus Caepio Brutus (b. 85 — d.

42 bc, near Philippi, Macedonia)

Roman politician, leader of the conspirators who assassinated Julius Caesar in 44 bc. He joined Pompey’s army against Caesar in the civil war (49) but was pardoned by Caesar after Pompey’s death. He joined the plot to murder Caesar out of his desire to restore the Roman republic.

After Caesar’s death, he and Gaius Cassius formed an army in Macedonia; Brutus defeated the Caesarians under Octavian (Augustus) in the first engagement of the Battle of Philippi, but Mark Antony and Octavian crushed his army in a second encounter. Realizing the republican cause was lost, Brutus committed suicide.

Bruyere, Jean de La See Jean de La Bruyere

Bryan, William Jennings (b.

March 19, 1860, Salem, 111.,

U.S. — d. July 26, 1925, Dayton, Tenn.) U.S. politician and orator. He practiced law at Jacksonville, 111. (1883-87), before moving to Lincoln, Neb., where he was elected to the U.S. Congress in 1890. In the U.S. House of Representatives (1891-95), he became the national leader of the Free Silver Movement; he advocated its aims in his “Cross of Gold” speech, which won him the Democratic Party nomination for president in 1896. He was the party’s nominee again in 1900 and 1908. In 1901 he founded a newspaper, The Commoner, and thereafter lectured widely to admiring audiences; he was called “the Great Commoner.” He helped secure the presidential nomination for Woodrow Wilson in 1912 and served as his secretary of state (1913-15), contributing to

Marcus Brutus, marble bust; in the Capitoline Museum, Rome

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world law by espousing arbitration to prevent war. A believer in a literal interpretation of the Bible, he was a prosecuting attorney in the Scopes trial (1925), in which he debated Clarence Darrow on the issue of evolution; the trial took a heavy toll on his health, and he died soon after it ended.

Bryant, Bear orig. Paul William Bryant (b. Sept. 11, 1913, Kingsland, Ark., U.S. — d. Jan. 26, 1983, Tuscaloosa, Ala.) U.S. collegiate football coach. He was an all-state tackle in high school and went on to play blocking end at the University of Alabama (1932-36). As head coach at the University of Kentucky (1946-53), his team won 60 games, lost 23, and tied 5. After coaching at Texas A&M University (1954-57), he returned to Alabama (1957-82). His Alabama coaching record of 323 wins, 85 losses, and 17 ties broke Amos Alonzo Stagg’s long-standing coaching record for games won; in 1985 it was broken by Eddie Robinson of Grambling State. In all, he took Alabama to 28 bowl games and six national championships.

Bryant, William Cullen (b. Nov. 3, 1794, Cummington, Mass., U.S.— d. June 12, 1878, New York,

N.Y.) U.S. poet. At age 17 Bryant wrote “Thanatopsis,” a meditation on nature and death that remains his best-known poem; influenced by

deism, it in turn influenced Ralph Waldo Emerson and Henry David Thoreau. Admitted to the bar at age 21, he spent nearly 10 years as an attorney, a profession he hated. His Poems (1821), including “To a Waterfowl,” secured his reputation.

In 1 825 he moved to New York City, where for almost 50 years (1829-78) he was editor in chief of the Evening Post, which he transformed into an organ of progressive thought.

Bryce Canyon National Park

Park, southern Utah, U.S. It is not a true canyon but rather a series of natural amphitheatres below which stands an array of limestone and

sandstone columns. Its geology is related to that of Grand Canyon and Zion national parks, since the stone of all three was formed while the entire region was under a shallow sea. The park, established in 1928, covers 35,835 acres (14,513 hectares).

William Cullen Bryant, detail of an oil painting by Daniel Huntington, 1 866; in the Brooklyn Museum collection.

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Bryn Mawr Vbrin-'morV College Private women’s liberal arts college in Bryn Mawr, Pa., near Philadelphia. Though founded in 1885 by a group of Quakers, it has long operated on a nondenominational basis. It offers a range of undergraduate and graduate programs in the arts and sciences, social research, and social work. It enjoys an academic exchange with nearby Haverford and Swarthmore colleges and the University of Pennsylvania.

Brynhild See Brunhild

bryophyte \'brI-3-,fit\ Any of the green, seedless land plants that make up the division Bryophyta, numbering at least 18,000 species and divided into three classes: Mosses, liverworts, and hornworts. They are distinguished from vascular plants and seed plants by the production of only one SPORE-containing organ in their spore-producing stage. Most bryophytes are 0.8-2 in. (2-5 cm) tall or, if reclining, generally less than 12 in. (30 cm) long. Found throughout the world, from polar regions to the tropics, they are most abundant in humid environments, though none is marine. Bryophytes are extremely tolerant of dry and freezing conditions. Peat moss is economically important to humans in horticulture and as an energy source. Some bryophytes are used ornamentally, as in moss gardens. In

nature, bryophytes initiate soil formation on barren terrain and maintain soil moisture, and they recycle nutrients in forest ecosystems. They are found on rocks, logs, and forest litter.

bryozoan V.bri-o-'zo-onV Aquatic invertebrate of the phylum Bryozoa (“moss animals”), members (called zooids) of which form colonies. Each zooid is a complete and fully organized animal. Species range in size from a one-zooid “colony” small enough (less than 0.04 in., or 1 mm, long) to live between sand particles to colonies that hang in clumps or chains as much as a 1.6 ft (0.5 m) across. The texture of colonies varies from soft

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brytenwalda ► Buchner I 287

and gelatinous to hard with calcium-containing skeletons. Freshwater bryozoans attach primarily to leaves, stems, and tree roots in shallow water. Marine bryozoans have a wide range of habitats, from coastal areas to great ocean depths, but are most common just below the tidemarks. Bryozoans feed by capturing plankton with their tentacles.

brytenwalda See bretwalda
BSE See mad cow disease

bubble chamber Subatomic-particle detector that uses a superheated liquid which boils into tiny bubbles of vapour along the tracks of the particles. As charged particles move through the liquid, they knock electrons from the atoms of the liquid, creating ions. If the liquid is close to its boiling point, the first bubbles form around these ions. The observable tracks can be photographed and analyzed to measure the behaviour of the charged particles. Developed in 1952 by Donald Glaser, the bubble chamber proved very useful in the 1960s and ’70s for the study of high-energy nuclear and particle physics.

Buber Vbii-borV, Martin (b. Feb. 8, 1878, Vienna, Austria-Hungary — d. June 13, 1965, Jerusalem) German Jewish religious philosopher and biblical translator. Brought up in Lemberg (now Lviv, Ukraine), he studied in Vienna, Berlin, Leipzig, and Zurich. Friedrich Nietzsche’s heroic nihilism led Buber, a nonobservant Jew, to Zionism. He advocated Jewish-Arab cooperation in Palestine and saw Hasidism as a healing power for the malaise of modern Judaism. Under Nazi pressure, he emigrated to Palestine in 1938, and he taught at Hebrew University until 1951. I and Thou (1923) expresses Buber’s belief that the human (I)

encounters God (Thou) as a distinct being, rather than merging in mystical union. The Bible was for Buber derived from the encounter between God and his people, but he rejected many of the Talmud's laws as emerging from a relationship in which God was objectified rather than truly addressed.

Bubka Vbub-ksN, Sergey (b. Dec. 14, 1963, Voroshilovgrad, Ukr., U.S.S.R.) Ukrainian pole-vaulter. He first cleared 6 m (19 ft 8 in.), long considered impossible, in Paris in 1985. In 1991 he cleared 6.1 m (20 ft), and he remains the only pole-vaulter to have done so. He won an Olympic gold medal in 1988 but failed to place at the 1992 Olympic Games. In 1994, at Sestriere, Italy, he vaulted a record 6.14 m (20 ft 1.75 in.) for his 17th outdoor record and his 35th overall.

buccaneer Any of the British, French, or Dutch sea adventurers who chiefly haunted the Caribbean and the Pacific seaboard of South America during the latter part of the 17th century, preying on Spanish settlements and shipping. Though inspired by such privateers as Englishman Francis Drake, the buccaneers were not legitimate privateers (the commissions they held were seldom valid), but neither were they the outlawed pirates who flourished in the 18th century. Usually escaped servants, former soldiers, or loggers, they ran their ships democratically, divided plunder equitably, and even provided a form of accident insurance. They influenced the founding of the South Sea Co., and stories of their adventures inspired more serious voyages of exploration as well as the tales of writers Jonathan Swift, Daniel Defoe, and Robert Louis Stevenson.

Buchanan \byu-'ka-n3n\, George (b. February 1506, Killeam, Stirlingshire, Scot. — d. Sept. 29, 1582, Edinburgh) Scottish humanist, scholar, and educator. As a teacher of Latin in Paris, Buchanan wrote bitter attacks on the Franciscans that landed him in jail for heresy. He escaped and became a teacher in Bordeaux, where Michel de Montaigne was one of his pupils. There he translated two of Euripides' plays into Latin and wrote original dramas. His paraphrase of the Psalms was long used for Latin instruction. At first a supporter of Mary, Queen of Scots, he later helped prepare the case that led to her execution. In De jure regni apud Scotos (1579), he argued for limited monarchy; Rerum Scotiacarum historia (1582) traces Scotland's history.

Buchanan \byu-'ka-n3n\, James (b. April 23, 1791, near Mercersburg, Pa., U.S. — d. June 1, 1868, near Lancaster) 15th president of the U.S. (1857-61). He was admitted to the bar in 1812 and soon established a successful law practice. He was elected to the Pennsylvania legislature in 1814 and later served in the U.S. House of Representatives (1821-31), as minister to Russia (1832-34), and in the U.S. Senate (1834 — 45). He was secretary of state in the cabinet of Pres. James K. Polk (1845-49). As minister to Britain (1853-56), he helped draft the Ostend Manifesto. In 1856 he was

elected president as a Democrat, defeating John C. Fremont. Although experienced in government and law, he lacked the courage to deal effectively with the slavery crisis, and he equivocated on the question of Kansas's status as a slaveholding state. The ensuing split within his party allowed Abraham Lincoln to win the election of I860. He denounced the secession of South Carolina following the election and sent reinforcements to Fort Sumter but failed to respond further to the mounting crisis. He was the only president never to have married.

Bucharest Vbu-k9- 1 rest\ Romanian Bucuresti \,bu-ku-'resht y \ City (pop., 1997: 2,057,512), capital of Romania. Excavations have revealed evidence of prehistoric settlement. The site gained importance when the rulers of Walachia moved there in the 14th century. Vlad III built a fortress there in the 15th century to ward off invading Turks; they eventually took it and made it their Ottoman Walachian capital in 1659. In the 19th century civic unrest helped force the union of Walachia and Moldavia, and Bucharest became the capital of the new Romanian state in 1862. Occupied by the Soviet army after World War II, it came under communist control. During the 1980s it was the scene of political demonstrations against the government of Nicolae Ceau$escu that resulted in his overthrow and execution.

Bucharest, Treaty of (May 7, 1918) Settlement forced on Romania after it had been defeated by the Central Powers in World War I. Romania was required to return southern Dobruja to Bulgaria, give Austria-Hungary control of the passes in the Carpathian Mtns., and lease its oil wells to Germany for 90 years. When the Central Powers collapsed in November 1918, the treaty was nullified.

Buchenwald Vbii-ksn-.valtX One of the first and biggest of the German Nazi concentration camps, established in 1937 near Weimar. In World War II it held about 20,000 prisoners, most of whom worked as slave laborers in nearby factories. Though there were no gas chambers, many perished through disease, malnutrition, exhaustion, beatings, and executions. Inmates were used to test the effects of viral infections and vaccines. The commandant's wife was the infamously sadistic lisa Koch (19067-1967), the "Witch of Buchenwald." See also Holocaust.

Buchner Vbuik-narV Georg (b. Oct. 17, 1813, Goddelau, Hesse-Darmstadt — d. Feb. 19, 1837, Zurich, Switz.) German dramatist. As a medical student, he became involved in revolutionary politics and was forced to flee to Zurich. There he wrote plays marked by vivid imagination and unconventional structure, combining extreme naturalism with visionary power; he is regarded as a forerunner of the Expressionist movement. His first play, Danton's Death (1835), a drama of the French Revolution, was followed by Leonce and Lena (1836), a satire on the illusions of Romanticism. His last play, Woyzeck (1836), anticipated the social drama of the 1890s with its compassion for the poor and oppressed; it became the basis of a famous opera by Alban Berg.

Buchner Vbtik-narV Hans (b. Dec. 16, 1850, Munich, Bavaria — d. April 5, 1902, Munich, Ger.) German bacteriologist. He served as a physician in the Bavarian army in the 1870s and taught at the University of Munich from 1880 until his death. Buchner was one of the first to note that a substance in blood serum could destroy bacteria. He named the

substance alexin; now known as complement, it consists of proteins called gamma globulins and is of great importance in immunology.

James Buchanan, photograph by Mathew Brady.

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Buchwald Vbuk-.woldX, Art(hur) (b. Oct. 20, 1925, Mt. Vernon, N.Y., U.S.) U.S. humour writer and columnist. Buchwald moved to Paris in 1948. His popular original column — reviews of the city's nightlife for the International Herald Tribune — increasingly included offbeat spoofs and candid comments from celebrities. After moving in 1961 to Washington, D.C., he began poking fun at issues in the news, soon becoming established as one of the sharpest satirists of American politics and modem life. His widely syndicated work won a Pulitzer Prize in 1982. His books include numerous collections of columns and the memoir I'll Always Have Paris (1996).

Buck, Pearl orig. Pearl Sydenstricker (b. June 26, 1892, Hillsboro, W.Va., U.S. — d. March 6, 1973, Danby, Vt.) U.S. author. Buck was reared in China by her missionary parents and later taught in a Chinese university. Her first book to reach a wide audience was The Good Earth (1931, Pulitzer Prize), describing the struggles of a Chinese peasant and his slave wife. Sons (1932) and A House Divided (1935) followed; the trilogy was published as The House of Earth (1935). Among her later works are short stories, novels (including five under the pseudonym John Sedges), and an autobiography. She received the Nobel Prize for Literature in 1938.

buckeye Any of about 13 trees and shrubs of the genus Aesculus (family Hippocastanaceae), native to North America, southeastern Europe, and eastern Asia. The name refers to the resemblance of the nut, which has a pale patch on a shiny red ground, to the eye of a deer. Buckeyes are valued as ornamental trees for their handsome candelabra-like flower clusters. Both the young foliage and the nuts are poisonous. Among the most notable is the Ohio buckeye (A. glabra), also called fetid buckeye and American horse chestnut, with twigs and leaves that yield an unpleasant odour when crushed. The sweet, or yellow, buckeye (A. flava, or A. octandra) is the largest buckeye, up to 89 ft (27 m) tall, and is naturally abundant in Great Smoky Mountains National Park, U.S.

Buckingham Palace London residence of the British sovereign. It takes its name from the house built there early in the 18th century for the

dukes of Buckingham. Victoria was the first sovereign to live there. John Nash began the reconstruction of Buckingham House as a Neoclassical palace in 1821, but was not allowed to finish. His garden front remains virtually unchanged, but the Mall front was redesigned in 1913 by Sir Aston Webb (1849-1930) as a background for the Queen Victoria Memorial statue.

Buckingham Vbok-iq-omV, 1 st duke of orig. George Villiers (b.

Aug. 28, 1592, Brooksby, Leicestershire, Eng. — d. Aug. 23, 1628, Portsmouth, Hampshire) English courtier and politician. Charming and handsome, he quickly became a royal favourite of James I and the future Charles I. He became lord high admiral in 1619 and was created a duke in 1623, but his arrogance and abuse of power made him highly unpopular. His erratic foreign policy led to a series of disasters, including failed military expeditions to Spain and France. A bill to impeach him was introduced in Parliament in 1626, prompting Charles to dissolve Parliament. When Buckingham was assassinated by a naval lieutenant, Londoners rejoiced.

Buckingham, 2nd duke of orig. George Villiers (b. Jan. 30, 1628, London, Eng. — d. April 16, 1687, Kirkby Moorside, Yorkshire) English politician. Born eight months before the assassination of his father, the 1st duke of Buckingham, he was brought up with the family of Charles I. He fought for Charles II in the English Civil Wars, and after the Restoration in 1660 Buckingham became a leading member of the king’s inner circle of ministers, known as the Cabal. Parliament had him dismissed from his posts for alleged Catholic sympathies in 1674.

Buckinghamshire Vbo-kiq-om-.shhA Administrative (pop., 2001: 479,028), geographic, and historic county, southern England. It is bordered by the River Thames, London, and the River Ouse valley in the north; its county seat is at Aylesbury. It was affected by each phase of English settlement, from the Neolithic to the Saxon. Under Saxon rule, as part of the kingdom of Mercia, it resisted Danish invasion and became prosperous. Before the 20th century it was a rural area, but the modem growth of London and the expansion of transportation links with it have brought population growth.

Buckley, William F(rank), Jr. (b. Nov. 24, 1925, New York, N.Y., U.S.) U.S. writer and editor. He attended Yale University, where he was chairman of the Yale Daily News. In 1955 founded the National Review, as editor in chief, he used the journal as a forum for his conservative views. His column “On the Right” was syndicated in 1962 and eventually appeared in more than 200 newspapers. From 1966 he hosted Firing Line, a weekly television interview program in which he often employed his wit and debating skills against ideological opponents. His books include God and Man at Yale (1951), Rumbles Left and Right (1963), and a series of spy novels.

buckling Mode of failure under compression of a structural component that is thin (see shell structure) or much longer than wide (e.g., post, column, leg bone). Leonhard Euler first worked out in 1757 the theory of why such members buckle. The definition by Thomas Young of the elastic modulus significantly propelled building construction science forward. The elastic theory formed the basis of structural analysis until World War II, when the behaviour of bomb-damaged buildings forced the modification

of some of the theory's underlying assumptions. See also post-and-beam SYSTEM.

buckminsterfullerene See fullerene

Buckner, Simon Bolivar (b. April 1, 1823, near Munfordville, Ky., U.S. — d. Jan. 8, 1914, near Munfordville) U.S. and Confederate military leader. He graduated from West Point and served in the Mexican War. In the American Civil War he established the Kentucky militia and became a Confederate general. Ordered to reinforce Fort Donelson, Tenn. (1862), he found the situation hopeless and unconditionally surrendered to Ulysses S. Grant. After his release in a prisoner exchange, he served the Confederacy in many capacities. He was later governor of Kentucky (1887-91).

buckwheat Either of two species (Fagopyrum esculentum, or sagittatum, and F. tataricum) of herbaceous plants and their edible, triangular seeds, used as a cereal grain though the plant is not a cereal grass. It is less productive than other grain crops on good soils but is particularly adapted to arid, hilly land and cool climates. Because it matures quickly, it can be grown as a late-season crop. It improves conditions for the cultivation of other crops by smothering weeds and may be planted as a green-manure crop. Buckwheat is often used as a feed for poultry and other livestock. It is high in carbohydrates and is about 11% protein and 2% fat. The hulled kernels, or groats, can be cooked and served much like rice. Buckwheat flour is unsatisfactory for bread but is used to make pancakes ("buckwheat cakes").

buckyball See fullerene

bud Small lateral or terminal protuberance on the stem of a vascular plant that may develop into a flower, leaf, or shoot. Buds arise from meristem tissue. In temperate climates, trees form resting buds that are resistant to frost in preparation for winter. Flower buds are modified leaves.

Budapest Vbii-do-.pesA City (pop., 2001: 1,775,203), capital of Hungary. Situated on the Danube River, it acquired its name in 1873 when the towns of Buda and Obuda on the river's right bank and the town of Pest on its left bank amalgamated. Inhabited from Neolithic times, Buda was the site of a Roman camp in the 2nd century ad. By the 13th century both Buda and Pest had German inhabitants. Buda was fortified by Matthias I Corvinus in the 15th century and became the capital of Hungary. It was taken and held by the Turks (1541-1686), then retaken by Charles V, duke of Lorraine. In 1848-49 both towns experienced nationalistic revolt, and Pest became the capital of Kossuth Lajos's revolutionary government. It became the centre of revolt for Hungarian independence in 1918. After World War II, it came under communist control. It was the base of an unsuccessful anticommunist uprising in 1956 (see Hungarian Revolution). Anticommunist unrest there in the 1980s led to the declaration of the Hungarian republic in 1989. Budapest is a vital Hungarian transport centre; its economy includes heavy industry and manufactures from telecommunications and electronics.

Buddha Vbii-doX orig. Siddhartha Gautama (fl. c. 6th^lth century, b. Kapilavastu, Shakya republic, Kosala kingdom — d. Kusinara, Mafia republic, Magadha kingdom) Indian spiritual leader and founder of Buddhism. The term buddha (Sanskrit: "enlightened one") is a title rather than a name, and Buddhists believe that there are an infinite number of past and future buddhas. The historical Buddha, referred to as the Bud-

dha Gautama or simply as the Buddha, was bom a prince of the Shakyas, on the India-Nepal border. He is said to have lived a sheltered life of luxury that was interrupted when he left the palace and encountered an old man, a sick man, and a corpse. Renouncing his princely life, he spent seven years seeking out teachers and trying various ascetic practices, including fasting, to gain enlightenment. Unsatisfied with the

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results, he meditated beneath the bodhi tree, where, after temptations by Mara, he realized the Four Noble Truths and achieved enlightenment. At Sarnath he preached his first sermon to his companions, outlining the Eightfold Path, which offered a middle way between self-indulgence and self-mortification and led to the liberation of nirvana. The five ascetics who heard this sermon became his first disciples and were admitted as bhiksus (monks) into the sangha, or Buddhist order. His mission fulfilled, the Buddha died after eating poisonous mushrooms served him by accident and escaped the cycle of rebirth; his body was cremated, and stupas were built over his relics.

Buddhism Major world religion and philosophy founded in northeastern India in the 5th century bce. Based on the teachings of Siddhartha Gautama, called the Buddha, Buddhism takes as its goal the escape from suffering and from the cycle of rebirth: the attainment of nirvana. It emphasizes meditation and the observance of certain moral precepts. The Buddha’s teachings were transmitted orally by his disciples; during his lifetime he established the Buddhist monastic order (sangha). He adopted some ideas from the Hinduism of his time, notably the doctrine of karma, but also rejected many of its doctrines and all of its gods. In India, the emperor Ashoka promoted Buddhism during the 3rd century bc, but it declined in succeeding centuries and was nearly extinct there by the 13th century. It spread south and flourished in Sri Lanka and Southeast Asia, and it moved through Central Asia and Tibet (see Tibetan Buddhism) to China, Korea, and Japan (see Pure Land Buddhism; Zen). In the 19th century, Buddhism spread to Europe and the United States, and it became increasingly popular in the West in the second half of the 20th century. Buddhism’s main teachings are summarized in the Four Noble Truths, of which the fourth is the Eightfold Path. Buddhism’s two major branches, Mahayana and Theravada, have developed distinctive practices and unique collections of canonical texts. In the early 21st century, the various traditions of Buddhism together had more than 375 million followers.

Buddhist councils In most Buddhist traditions, two early councils on doctrine and practice. The first, which most modern scholars do not accept as historical, was reputedly held at Rajagrha (modern Rajgir), India, during the first rainy season after the Buddha’s death, to compile his remembered words, including the sutras and monastic rules. The second, which is accepted as historical, met more than a century later at Vaisali, India, to resolve disputes within the monastic community. Theravada Buddhism recognizes subsequent councils: a third, called by Ashoka c. ad 247, at which the doctrinal disputes were resolved in its favor, and others con-

tinuing up to the mid-20th century. Other Buddhist traditions recognize other important councils at which their respective canons were established or edited.

budding bacteria Group of bacteria that reproduce by budding. Each bacterium divides following unequal cell growth; the mother cell is retained, and a new daughter cell forms. In budding, the cell wall grows from one point on the cell rather than throughout the cell; this type of growth permits the development of more complex structures and processes. Most budding bacteria are aquatic and can attach to surfaces by their stalks; some are free-floating.

buddleia Vbod-le-oV or butterfly bush Any of more than 100 species of plants constituting the genus Buddleia , native to tropical and subtropical areas of the world. The genus was formerly included in the family Loganiaceae (order Gentianales) but is now placed in the family Buddlejaceae (order Scrophulariales), which includes about 10 genera and more than 150 species. Most species of Buddleia have hairy or scaly leaves and clusters of purple, white, yellow, or orange flowers. Several species are cultivated as garden ornamentals.

Budenny \bu-'dy6-ne\, Semyon (Mikhaylovich) (b. April 13, 1883, Kozyurin, near Rostov-na-Donu, Russia— d. Oct. 17, 1973, Moscow, Russia, U.S.S.R.) Russian army officer. In 1919 he joined the Communist Party and, as commander of the 1st Cavalry Army in the Russian Civil War, he played a crucial role in defeating the White (anti-Bolshevik) generals Anton Denikin and Pyotr Wrangel and in fighting the Poles (1920). He later became a marshal of the Soviet Union and was commander of Moscow’s military district.

Budge, (John) Don(ald) (b. June 13, 1915, Oakland, Calif., U.S.— d. Jan. 26, 2000, Scranton, Pa.) U.S. tennis player. He won his very first tournament, the California Boys State Singles title (1930). In 1936 he became the first lawn-tennis player to win the grand-slam (the Australian, French, British, and U.S. singles championships). At Wimbledon in both

1937 and 1938, he won not only the singles but also the men’s doubles and mixed doubles. Representing the U.S. four times in the Davis Cup competition (1935-38), he won 25 of 29 matches. He turned professional in 1939. He is noted for having developed the backhand into an offensive stroke.

Buell \'byiil\, Don Carlos (b. March 23, 1818, near Marietta, Ohio, U.S. — d. Nov. 19, 1898, Rockport, Ky.) U.S. general. A graduate of West Point, he was appointed general of volunteers at the start of the American Civil War, and he helped organize the Union’s Army of the Potomac. He was sent to Kentucky to succeed William T. Sherman and to organize the Army of the Ohio. In 1862 he was Union commander in the Kentucky campaign against Confederate forces under Braxton Bragg. Following the Battle of Perry ville, he was removed from his command for alleged tardiness in his pursuit of Confederate forces.

Buena Vista \,bwa-na-'ves-ta\. Battle of Battle fought in 1847 near Monterrey, Mexico, in the Mexican War. A U.S. force of 5,000 commanded by Gen. Zachary Taylor and assisted by Jefferson Davis invaded northern Mexico and engaged a Mexican force of 14,000 under Gen. Antonio Santa Anna. The U.S. forces repulsed the Mexican attack, and

the Mexicans retreated with 1,500 casualties. Taylor’s victory helped him win the 1848 U.S. presidential election.

Buenos Aires \,bwa-n3s-'ar-ez,\ Spanish \,bwa-nos-'I-ras\ City (pop., 2001: city, 2,776,138; metro, area, 12,046,799), capital of Argentina. Located on an estuary of the Rio de la Plata in east-central Argentina, about 150 mi (240 km) from the Atlantic Ocean, it is nevertheless a major port. First colonized by the Spanish in 1536, it was not permanently settled until 1580. It became the seat of the Viceroyalty of the Rio de la Plata in 1776. In 1853 the city and the surrounding area that made up the province of Buenos Aires refused to recognize a new constitution approved by the country’s other provinces and began fighting with them intermittently over control of the Argentine government. After being made a federal district and Argentina’s capital, it settled its wars with the other provinces (1880) and by World War I (1914-18) had become a thriving port. The country’s largest and most influential city, it is an important industrial and transportation centre.

buffalo Any member of several bovid species, including the massive water buffalo and Cape buffalo. The name is often applied to the American bison. The anoa {Anoa depressicornis) is a tiny, dark-brown buffalo of the dense, mature forests of Sulawesi. A shy animal, it stands 2.5-3 ft (0.75-1 m) at the shoulder and has straight, sharp-tipped horns. It is hunted for food, hides, and horns. A slightly larger species, the tamarau (A. mindorensis), inhabits the Philippine island of Mindoro. Exceedingly shy and wild, its numbers have been greatly reduced.

Cape, or African, buffalo (Syncerus caffer).

MARK BOULTON-THE NATIONAL AUDUBON SOCIETY COLLECTION/PHOTO RESEARCHERS

Buffalo City (pop., 2000: 292,648), western New York, U.S. Located at the northeastern point of Lake Erie on the Niagara River, it is the terminus of the New York State Barge Canal. Settled by American Indians in 1780, the site was laid out as a town at the beginning of the 19th century. It was a military post in the War of 1812 and was burned by the British. Rebuilt

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in 1814-15, it became the western terminus of the Erie Canal, which brought an economic boom to the community. A major port on the St. Lawrence Seaway and the main U.S. gateway to Ontario’s Toronto-Hamilton industrial region, it processes much of U.S. -Canadian trade. It is also an educational and medical research centre.

Buffalo Bill See William F. Cody

buffalo soldier Nickname given to members of African American cavalry regiments of the U.S. Army who served in the western U.S. (1867-96). An 1866 law authorized the army to form cavalry and infantry regiments of African American men under the command of white officers; the result was the 9th and 10th cavalries and the 38th through 41st infantries. The primary mission of the cavalry regiments was to control Indians on the western frontier (the nickname “buffalo” was given by the Indians). The soldiers took part in almost 200 engagements. Noted for their courage and discipline, they had the army’s lowest desertion and court-martial rates. One of the 10th Cavalry’s officers was John Pershing, whose nickname “Black Jack” reflected his advocacy on behalf of African American troops.

buffer Solution usually containing a weak acid and its conjugate weak base, or a salt, of such a composition that the pH is held constant within a certain range. An example is a solution containing acetic acid (CH_3COOH) and the acetate ion (CH_3COO^-). The pH depends on their relative concentration and can be found with a simple formula involving their ratio. Relatively small additions of acid or base will change the concentration of the two species, but their ratio, and hence the pH, will not change much. Different buffers are useful in different pH ranges; they include phosphoric acid, citric acid, and boric acid, each with their salts. Biological fluids such as blood, tears, and semen have natural buffers to maintain them at the pH required for their proper function. See also law of MASS ACTION.

Buffett, Warren (b. Aug. 30, 1930, Omaha, Neb., U.S.) U.S. businessman and investor. He attended the University of Nebraska (B.S., 1950) and Columbia University (M.S., 1951), where he was influenced by professor Benjamin Graham’s approach toward value investing — that is, purchasing shares of companies whose stocks are priced below their intrinsic value. Returning to his native Omaha, he turned $105,000 of initial investment in his Buffett Partnership (1956-69) into $105 million by the time of its dissolution. He then began investing in businesses, bought under the umbrella of the textile manufacturer Berkshire Hathaway. He is said to be the first person to have made $1 billion in the stock market. His financial reports are read eagerly by stock-market novices and experts alike for their pithy wisdom.

Buffon \biB- , fo n \ / G(eorges)-L(ouis) Leclerc, comte de (b. Sept. 7, 1707, Montbard, Fr. — d. April 16, 1788, Paris) French naturalist. He studied mathematics, medicine, and botany until a duel forced him to cut short his studies. He settled on his family’s estate, where he researched the calculus of probability, the physical sciences, and forest management. Appointed keeper of the royal botanical garden (Jardin du Roi) in 1739, he was also assigned the cataloging of the royal natural history collections, an undertaking that grew into his comprehensive work Histoire naturelle, generate et particuliere (1749-1804), an attempt to account for all known flora and fauna, of which he published 36 of the proposed 50 volumes before his death. He was ennobled in 1773.

bug Coding error in a computer program that prevents it from functioning as designed. Most software companies have a quality-assurance department which is charged with finding program bugs while the program is in development (debugging); bugs are also often detected by means of beta testing (testing of a product, often by potential consumers, before it is placed on the market). The term originated in a computer context in 1945 when a moth flew into and jammed an electrical relay of the

Harvard Mark II computer; it was extracted and taped into the log book with the inscription “First actual case of bug being found” (the term having previously been used for other kinds of mechanical defects).

bug Commonly, any insect; scientifically, any member of the insect order Heteroptera. In scientific usage, when the word “bug” is part of the common name for a member of the order Heteroptera, it is a separate word (e.g., “chinch bug”); when used as part of the common name for an organism that is not a heteropteran, it is not separated (e.g., the ladybug, in the order Coleoptera). In common usage, there are many exceptions to this convention (e.g., bedbugs are heteropterans).

Bug \'bug\ River or Western Bug River River, eastern Europe. Rising in western Ukraine, it flows north along the Poland-Ukraine and Poland-Belarus borders to Brest, and turns west into Poland to the Vistula River north of Warsaw, running a total of 516 mi (830 km). It is navigable below Brest. In World War I several battles were fought along its course in 1915. About 200 mi (322 km) of its central course formed part of the Curzon Line, a demarcation line between Poland and Soviet Russia for much of the 20th century.

bugaku \bu-'ga-ku\ Repertoire of stylized dances of the Japanese imperial court, derived from the traditional dance forms of China, Korea, India, and Southeast Asia. The dances are divided into two basic forms: “dances of the left” (saho no mai), accompanied by music derived from China, with dancers wearing red costumes; and “dances of the right” (uho samai no mai), accompanied by music introduced from Korea, with dancers wearing costumes of blue or green. The dancers wear elaborate masks of painted wood to portray fictional characters.

Buganda \bii-'gan-d3\ Precolonial kingdom, East Africa. Located along the northern shore of Lake Victoria in present-day Uganda, the kingdom was founded in the late 14th century by the Ganda people. Ruled by the kabaka, or king, by the 19th century Buganda was the most powerful kingdom in the area. In 1900 it became a British protectorate. The Ganda subsequently played a major role in assisting British administration in East Africa. When Uganda became independent in 1962, Buganda was accorded special federal status within the new country. Ensuing tensions with the central government led in 1967 to the kingdom’s abolition and the area’s integration into Uganda. Buganda was restored in 1993.

Bugatti Xbii-'gat-teX, Ettore (Arco Isidoro) (b. Sept. 15, 1881, Milan, Italy — d. Aug. 21, 1947, Paris, France) Italian builder of racing and luxury automobiles. His factory at Mosheim, Alsace (founded 1909), produced a highly successful low-powered racer for Le Mans. His luxurious Type 41 (“Golden Bugatti” or “La Roy ale”), produced in the 1920s, was probably the most meticulously built of all cars; no more than eight were constructed. His firm did not survive long after his death.

Buginese \,b3g-3-'nez\ Culturally dominant ethnic group of Celebes (Sulawesi), Indonesia. Their trading-port city Macassar (modern Ujung Pandang) fell to the Dutch in 1667, and they emigrated to other parts of the Malay Peninsula, establishing Buginese states in Selangor and Riau. They continued to harry the Dutch and also fought with the Malays. Their conflicts with the latter cost them their supremacy in the region by 1800. Early converts to Buddhism, the Buginese were converted to Islam in the 17th century. Today they number about 3.3 million. Their village economy

is based on rice cultivation and some trade between islands.

bugle Soprano brass instrument historically used for hunting and military signaling. It developed from an 1 8th-century semicircular German hunting horn with widely expanding bore. In the 19th century the semicircle was reshaped into an oblong double loop. Natural bugles use only harmonics 2-6 (producing tones of the C triad) in their calls (“Reveille,” “Taps,” etc.). The keyed bugle, patented in 1810, has six sideholes and keys which give it a complete chromatic scale. In the 1820s valves were added to produce the flugelhorn and, in lower ranges, the baritone, euphonium, and saxhorns.

building code Systematic statement of a body of rules that govern and constrain the design, construction, alteration, and repair of buildings. Such codes are based on requirements for the safety, health, and quality of life of building users and neighbors, and vary from city to city. Model codes developed by states, professional societies, and trade associations — including the BOCA (Building Officials and Code Administrators) coda, National Building Code, Uniform Building Code, and Standard Building Code — are typically adopted by local communities, with amendments. New York City’s code is the oldest (1916) and, because of the city’s population density and such concerns as fire prevention, adequate light, and ventilation, the most stringent.

building construction Techniques and industry involved in the assembly and erection of structures. Early humans built primarily for shelter, using simple methods. Building materials came from the land, and fabrication was dictated by the limits of the materials and the builder’s hands. The erection sequence involved, as now, first placing a foundation (or using the ground). The builder erected the structural system; the structural material (masonry, mud, or logs) served as both skeleton and enclosure. Traditional bearing- wall and post-and-beam systems eventually gave

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way to framed structures, and builders became adept at sealing and fireproofing with a variety of claddings (exterior coverings) and finishes. Steel-framed buildings are usually enclosed by curtain walls. In modern-day construction, sheathing the skeleton of the building is only the beginning; specialists then begin the bulk of the work inside, installing plumbing, electrical wiring, HVAC (heating, ventilating, and air-conditioning), windows, floor coverings, plasterwork, moldings, ceramic tile, cabinets, and other features. See also architecture.

building stone See building stone

Bujumbura V.bii-jom-'bur -d\ formerly Usumbura City (pop., 2001: 346,000), capital of Burundi. Lying on the northern end of Lake Tanganyika, it is the country’s chief port and largest urban centre. Known as Usumbura in the 1890s when German troops occupied the area and incorporated it into German East Africa, it was included in a Tutsi kingdom.

When Burundi achieved independence in 1962, the city's name was changed to Bujumbura. Its industry specializes in textiles and agricultural products; most of Burundi's foreign trade is shipped between the capital and Kigoma, Tanzania.

Bukhara or Bokhara or Buxoro \bo-'ka-ra, bti-'kar-oX City (pop., 1999 est.: 237,900), west-central Uzbekistan. Lying east of the Amu Darya, it was founded in the 1st century ad and was a major trade centre when the Arabs captured it c. 710. Built up by the Samanid dynasty, it became the capital of their realm, which at its height encompassed much of southern Central Asia. After falling to Genghis Khan in 1220 and to Timur in 1370, it was taken by the Uzbeks, who in the 16th century made it the capital of the khanate of Bukhara. In 1868 the khanate was made a Russian protectorate and in 1920 a Soviet republic. Bukhara was the capital until the republic was absorbed into the Uzbek S.S.R. in 1924. It became part of Uzbekistan on that country's independence in 1991 . Historic buildings in the central city were designated a UNESCO World Heritage site in 1993.

Bukhari \bu-'kar-e\, (Abu 'Abd Allah Muhammad ibn IsmaTl)

al- (b. July 19, 810, Bukhara, Central Asia — d. Aug. 31, 870, Khartank, near Samarkand) Muslim compiler and scholar of Hadith. He began his study as a child in Central Asia and traveled as far as Mecca and Cairo to learn about Muhammad and his utterances. Of the 600,000 traditions he collected, he deemed 7,275 authentic and included them in Kitdb al-jamf al-sahlh ("Entirety of the Genuine"). His Kitdb al-td'nkh al-kabir ("The Great History") contains biographies of those who passed on the oral traditions from the days of the Prophet to Bukhari's own era.

Bukharin Vbii-'kar-onV Nikolay (Ivanovich) (b. Oct. 9, 1888, Moscow, Russia — d. March 14, 1938, Moscow) Russian communist leader and economist. After the Bolsheviks seized power, he became the editor of the party newspaper Pravda (1917-29). A member of the Politburo and a prominent leader of the Comintern, he also wrote several theoretical economic works. In 1938 he was a defendant in the last of the public purge trials. Falsely accused of counterrevolutionary activities and espionage, he was found guilty and executed.

Bukovina \,bu-ko-'ve-na\ Region, eastern central Europe. It consists of part of the northeastern Carpathian Mtns. and the adjoining plain. Settled by both Ukrainians and Romanians, it became an integral part of Moldavia in the 14th century. It acquired its own name in 1775, when it was ceded to Austria by the Turks. Romania occupied it when Austria-Hungary collapsed in 1918, and was granted it through treaty in 1919. In 1944 the Soviet Union took the northern region, which became part of the Ukrainian S.S.R. (now Ukraine), while the rest became part of the Romanian People's Republic (now Romania).

Bukowski, Charles (b. Aug. 16, 1920, Andernach, Ger. — d. March 9, 1994, San Pedro, Calif., U.S.) German-bom U.S. poet, short-story writer, and novelist. His family immigrated to Los Angeles in 1922. He began publishing short stories in the mid 1940s. His first poetry collection, Flower, Fist and Bestial Wail, appeared in 1959, and the poetry volumes he published regularly for the next few years earned a devoted cult following. His novels include Post Office (1971) and Factotum (1975); he also wrote the screenplay for the film Barfly (1987), a semiautobiographical comedy about alcoholic lovers. The novel Hollywood (1989) dealt

with its filming. His writing, often scurrilous but humorous, frequently reflected his perpetually down-and-out mode of existence.

Bulawayo \,bu-la-'wa-yo\ City (pop., 1998 est.: 790,000), southwestern Zimbabwe. One of the country's largest cities, it lies 4,400 ft (1,340

m) above sea level. Originally the headquarters of the king of the Ndebele, it was occupied in 1893 by the British. It is Zimbabwe's principal industrial centre and, as headquarters for the country's railroads, its main transshipment point for goods to and from South Africa.

bulb In botany, the resting stage of certain seed plants, particularly perennial monocotyledons (see cotyledon), consisting of a relatively large, usually globe-shaped, underground bud with membranous or fleshy overlapping leaves arising from a short stem. The fleshy leaves function as food reserves that enable a plant to lie dormant when water is unavailable (during winter or drought) and to resume active growth when favourable conditions again prevail. There are two main types of bulbs. One, typified by the onion, has a thin papery covering protecting its fleshy leaves. The other, the scaly bulb, as seen in true lilies, has naked storage leaves, with no papery covering, making the bulb appear to consist of angular scales. Bulbs enable many common ornamentals, such as the narcissus, tulip, and hyacinth, to flower rapidly in early spring when growing conditions are favourable. Other bulb-producing plants bloom in the summer (e.g., lilies) or fall (e.g., the autumn crocus). The solid corms of the crocus and gladiolus and the elongated rhizomes of some irises are not bulbs.

Bulfinch, Charles (b. Aug. 8, 1763, Boston, Massachusetts Bay Colony — d. April 4, 1844, Boston, Mass., U.S.) First professional U.S. architect. He studied at Harvard University and then toured Europe, visiting major architectural sites in France and Italy. Most of his works incorporate Classical orders and show a mastery of proportion. Chiefly a designer of government buildings, he served as architect of the U.S. Capitol in 1817-30. He used the plans of his immediate predecessor, Benjamin H. Latrobe, for the wings but prepared a new design for the rotunda. His son Thomas Bulfinch (1796-1867) wrote the famous Bulfinch' s Mythology.

Bulgakov \biil-'ga-k3f\, Mikhail (Afanasyevich) (b. May 15,

1891, Kiev, Ukraine, Russian Empire — d. March 10, 1940, Moscow, Russian S.F.S.R., U. S.S.R.) Russian playwright, novelist, and short-story writer. He wrote and staged many popular plays in the years 1925-29, including dramatizations of his own novels, but by 1930 his trenchant criticism of Soviet mores had caused him to be effectively prohibited from publishing. His works, known for their scathing humour, include the novella The Heart of a Dog (written 1925), a satire on pseudoscience that did not appear openly in the Soviet Union until 1987, and the dazzling fantasy The Master and Margarita, not published in unexpurgated form until 1973.

Bulganin \bul-'ga-nyin\, Nikolay (Aleksandrovich) (b. June 11,

1895, Nizhy Novgorod, Russia — d. Feb. 24, 1975, Moscow, Russia, U.S.S.R.) Soviet statesman and industrial and economic administrator. After supporting Nikita Khrushchev in the latter's power struggle with Georgy Malenkov, Bulganin was made premier of the Soviet Union

(1955-58). Though closely identified with Khrushchev, he joined an “anti-party group” that tried to oust Khruschev in 1957, a move that led to his own downfall.

Bulgaria officially Republic of Bulgaria Country, southeastern Europe. Area: 42,858 sq mi (111,002 sq km). Population (2005 est.): 7,740,000. Capital: Sofia. Bulgarians make up the great majority of the population; smaller ethnic groups include Turks, Roma (Gypsies), and Macedonians. Languages: Bulgarian (official), regional dialects. Religions: Christianity (predominantly Eastern Orthodox; also other Christians); also Islam. Currency: lev. Three major regions define the landscape. The northernmost is the Danubian Plain, a fertile area occupying one-third of the country. Immediately south lie the Balkan Mountains (Stara Planina). In the southwest and south lie the Rhodope Mountains, with the country’s highest point, Musala Peak, rising 9,596 ft (2,925 m). Smaller than the three major regions, Bulgaria’s Black Sea coast is a popular eastern European resort area. Major drainage systems include the Black and Aegean seas. Bulgaria had a planned economy modeled on the Soviet system (1946-89). Since 1991 the noncommunist government has been moving to privatize some sectors of the economy, including agriculture. Bulgaria is a republic with one legislative body; its chief of state is the president, and its head of government is the prime minister. Evidence of human habitation dates from prehistoric times. Thracians were the first recorded inhabitants, dating from c. 3500 bc, and their first state dates from about the 5th century bc. The area was subdued by the Romans, who divided it into the provinces of Moesia and Thrace. In the 7th century ad the Bulgars took the region south of the Danube

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River. The Byzantine Empire in 681 formally recognized Bulgar control over the area between the Balkans and the Danube, though it would again dominate Bulgaria from the early 11th century to the late 12th century. Late in the 14th century Bulgaria fell to the Ottoman Turks and again lost its independence. At the end of the Russo-Turkish War (1877–78), Bulgaria rebelled. The ensuing Treaty of San Stefano was unacceptable to the great powers, and the Congress of Berlin (1878) resulted. In 1908 the Bulgarian ruler, Ferdinand, declared Bulgaria's independence. After its involvement in the Balkan Wars (1912-13), Bulgaria lost territory. It sided with the Central Powers in World War I and with Germany in World War II. A communist coalition seized power in 1944, and in 1946 a people's republic was declared. With other eastern European countries in the late 1980s, Bulgaria experienced political unrest; its communist leader resigned in 1989. A new constitution that proclaimed a republic was implemented in 1991. Economic turmoil followed Bulgaria into the 21st century as it sought political stability and joined NATO in 2004.

Bulgarian Horrors Atrocities committed by the Ottoman empire in subduing the Bulgarian rebellion of 1876. The name was used by William E. Gladstone in his pamphlet publicizing the incident. About 15,000 persons were reportedly massacred at Philippopolis (now Plovdiv), and villages and monasteries were destroyed. Despite widespread public indignation, the European powers did little in response. The crisis ended with the Congress of Berlin, which created a small, autonomous principality of Btilgaria.

Bulgarian language South Slavic language spoken by about nine million people in Bulgaria and enclaves in Romania, Moldova, Ukraine, and Turkey. Closely related is Macedonian, spoken by two to three million people in Macedonia, adjacent parts of Albania and Greece, and enclaves elsewhere. Both languages differ from other major Slavic languages in several features. Both are direct descendants of Old Church Slavonic. Under Ottoman rule, literary production was solely in Church Slavonic. The Bulgarian vernacular became a literary language only in the mid- 19th century; it was codified on the basis of northeastern Bulgarian dialects in 1899. Though efforts to create a literary Macedonian were underway before the Balkan Wars (1912-13), it was not formally recognized as a distinct language until the declaration of a Macedonian Republic within nascent communist Yugoslavia (1944).

Bulge, Battle of the (Dec. 16, 1944-Jan. 16, 1945) In World War II, the last German offensive on the Western Front, an unsuccessful attempt to divide the Allied forces and prevent an invasion of Germany. The "bulge" refers to the wedge that the Germans drove into the Allied lines. In December 1944, Allied forces were caught unprepared by a German

counterthrust in the wooded Ardennes region of southern Belgium. The German drive, led by Gerd von Rundstedt's panzer army, was initially successful but was halted by Allied resistance and reinforcements led by George Patton. The Germans withdrew in January 1945, but both sides suffered heavy losses.

Buli style Vbu-le\ African wood sculpture made by the Luba people in the village of Buli, Congo (Zaire). The most typical examples are statues of ancestor figures and stools with seats supported on the heads and fingertips of figures. Because the carvings are almost identical and differ from other Luba carvings, they were once thought to be the work of a single artist, known as the Master of Buli, but it was later determined that they were actually produced in a workshop.

bulimia nervosa Xbii-Te-me-o-nor-'vo-soN Eating disorder, mostly in women, in which excessive concern with weight and body shape leads to binge eating followed by compensatory behaviour such as self-induced vomiting or the excessive use of laxatives or diuretics. The disorder typically begins in adolescence or early adulthood and is associated with depression, anxiety, and low self-esteem. Bulimia can have serious medical complications such as dental decay and dehydration. Treatment may include psychotherapy. Unlike persons with anorexia nervosa, most bulimics remain close to their proper weight.

bulk modulus Vma-jo-losV Numerical constant that describes the elastic properties of a solid or fluid under pressure from all sides. It is the ratio of the tensile strength or compressive force per unit surface area to the change in volume per unit volume of the solid or fluid and thus is a measure of a substance's ability to resist deformation. Its units are newtons per square metre (N/m 2). Matter that is difficult to compress has a large bulk modulus; for example, steel has a bulk modulus of 1.6 x 10 11 N/m 2 , three times that of glass (i.e., glass is three times more compressible than steel).

Bull, John (b. 1562/63, Radnorshire, Wales? — d. March 12/13, 1628, Antwerp, Spanish Netherlands) British composer. He became organist of Hereford Cathedral in 1582, then organist at the Chapel Royal in 1591. In 1613 he departed for the continent to escape punishment for adultery; he held important organist positions in Brussels and Antwerp until his death. He wrote many verse anthems but is remembered for his keyboard works. In an era of remarkable English music for the virginal (a small harpsichord), he produced works that, with their resourceful keyboard figurations, reflect his own brilliant technique.

Bull \'btil\. Ole (Bornemann) (b. Feb. 5, 1810, Bergen, Nor. — d. Aug. 17, 1880, Lyspen, near Bergen) Norwegian violinist. After training in his native Bergen, he freelanced in Christiania (now Oslo) in 1828-31. His Paris concerts, which featured Norwegian songs played on a folk violin, won much attention, and he toured Europe and the U.S. for two decades. A longtime nationalist, he was brought back home by the revolution of 1848. He helped found the Norwegian Theatre in Bergen, and in 1852-53 he established the socialist colony Oleona in Pennsylvania; debts from the failed experiment kept him touring the rest of his life. Much of the music he composed is lost.

bull market In securities and commodities trading, a rising market. A bull is an investor who expects prices to rise and, on this assumption, buys a security or commodity in hopes of reselling it later for a profit. A

bullish market is one in which prices are expected to rise. See also bear MARKET.

Bull Moose Party U.S. dissident political party that nominated former president Theodore Roosevelt for the presidency in 1912. Formed by Sen. Robert La Follette in 1911 as the National Republican Progressive League, it opposed the conservatism of the Republican Party controlled by Pres. William H. Taft. The party derived its name from the characteristics of strength and vigour that Roosevelt attributed to himself. In 1912 Roosevelt won 25% of the popular vote; thus split, the Republicans lost the election to the Democratic candidate, Woodrow Wilson. The party gradually dissolved, and the Republicans were reunited in 1916. See also Progressive Party.

bull- roarer Flat piece of wood, several inches to a foot in length, fastened at one end to a string, by which it is swung around in the air to produce a whirring or howling sound likened to those of animals or spirits. It has been observed in Australia, the Americas, and other areas where indigenous societies survive. It may symbolize totemic ancestors, or it

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may be believed to cause or cure sickness, warn women and children away from men’s sacred ceremonies, control the weather, or promote fertility in animals and crops.

Bull Run, Battles of Two engagements of the American Civil War fought at a stream near Manassas, Va. The first battle (also called First Manassas) was fought on July 21, 1861, between 37,000 Union troops under Gen. Irvin McDowell (1818-85) and 35,000 Confederate troops under P.G.T. Beauregard and Joseph Johnston. In this first major encounter of the war, the Union assault was beaten back and the army retreated to Washington, D.C. The second battle took place on Aug. 29-30, 1862, between a Confederate force of more than 56,000 under Robert E. Lee and a Union army of more than 70,000 under John Pope. To prevent the Union army from being joined by the Army of the Potomac, Lee sent troops under Stonewall Jackson to march around Pope’s right flank. Lee’s attack forced the Union troops to withdraw as far as Washington, D.C. Casualties numbered 15,000 for the North and 9,000 for the South. Both battles strengthened the South’s resolve and caused the North to review its military leadership and strategy.

bull terrier Breed of dog developed in 19th-century England from the bulldog and the now-extinct white English terrier. The Spanish pointer was later bred into the line to increase its size. The bull terrier was developed as a courageous fighting dog but not an aggressive fight provoker, and it is generally friendly. A muscular dog, it is considered, for its weight, the strongest of all dogs. It has a short coat, tapering tail, erect ears, and deep-set eyes. It stands 19-22 in. (48-56 cm) high and weighs 50-60 lbs (23-27 kg). There are two varieties, coloured and white.

bulldog or English bulldog Centuries-old breed of dog developed in Britain to fight bulls. Powerful and courageous, often vicious, and largely unaware of pain, the bulldog nearly disappeared when dogfighting was outlawed in 1835. Fanciers of the breed saved it and bred out its ferocity. It is now considered gentle and reliable. It has a large head, folded ears, a short muzzle, a protruding lower jaw, and loose skin that forms wrinkles on the head and face. Its short, fine coat is tan, white, reddish brown, brindle, or piebald. It stands 13-15 in. (34-38 cm) high and weighs 40-50 lbs (18-23 kg).

Buller River River, South Island, New Zealand. It was named for Charles Buller, founder of the New Zealand Co. It is the major river of the island's west coast. Rising in the central highlands, it flows west 110 mi (177 km) into the Tasman Sea. Its gorge, which is most scenic at Inangahua Junction, is an important tourist attraction.

bulletin-board system (BBS) Computerized system used to exchange public messages or files. A BBS is typically reached by using a dial-up modem. Most are dedicated to a special interest, which may be an extremely narrow topic. Any user may "post" his or her own message (so that they appear on the site for all to read). Bulletin boards produce "conversations" between interested participants, who may download or print out messages they desire to keep or pass on to others. BBS sites today number in the tens of thousands. See also newsgroup.

bullfighting Spanish corrida de toros Spectacle, popular in Spain, Portugal, and Latin America, in which matadors ceremonially taunt, and usually kill, bulls in an arena.

Spectacles with bulls were common in ancient Crete, Thessaly, and Rome. In the modern era, Roman amphitheatres were rebuilt and embellished for use as bullrings. The largest are in Madrid, Barcelona, and Mexico City. The corrida, which usually involves six individual fights, begins with a procession of matadors and their entourages. At the beginning of each fight an assistant (banderillero) performs a preliminary maneuver to allow the matador to assess the animal's behaviour. The matador then performs his capework, drawing the bull as close to him as possible without being gored. This is followed by the entrance of the picadors, horsemen who jab the bull with

lances to weaken its neck and shoulder muscles. The matador then ritually slays the bull using a sword. In the Portuguese version of the ritual, the bull is fought from horseback and is not killed in the arena. Bullfighting has been banned in many countries.

bullfinch Any of several species of stocky, stout-billed songbird (family Fringillidae). Eurasia has six spe-

cies of the genus Pyrrhula, all boldly marked. The common bullfinch (P. pyrrhula), 6 in. (15 cm) long, is black and white; the male has a pinkish orange underside. It has a soft warbling call and is a popular cage bird. Usually found in evergreen groves and hedgerows, it is notorious for eating the buds of fruit trees. The trumpeter bullfinch (Rhodopechys githaginea), of arid localities from the Canary Islands to India, is a pale bird with a blaring buzzy note.

bullfrog Solitary aquatic frog (. Rana catesbeiana) named for its loud call. The largest U.S. frog, native to the eastern states, the bullfrog has been introduced into the western states and into other countries. The bullfrog is green or brown with a white to yellowish belly and dark-barred legs. Its body is about 8 in. (20 cm) long, and its hindlegs may be 10 in. (25 cm) long. Large adults weigh 1 lb (0.5 kg) or more.

Bullfrogs usually live in or near a body of still water. They are used for food and as laboratory animals. The name is sometimes applied to other large frogs.

bullhead Any of several species of North American freshwater catfish in the genus Ictalurus, valued as food and sport fishes. Bullheads are related to the channel catfish (/. punctatus) and other large North American species, but their tail is squared, rather than forked, and they are generally less than 12 in. (30 cm) long. The black bullhead (/. melas) is found in the Mississippi Valley, the yellow and brown bullheads (/. natalis and I. nebulosus) east of the Rocky Mtns., and the flat bullhead (I. platycephalus) in coastal streams between North Carolina and Florida. The name is sometimes applied to sculpins.

bullionism Monetary policy of mercantilism, which called for national regulation of transactions in foreign currency and precious metals (bullion) in order to maintain a favourable balance in the home country. Bullionism is most closely associated with 16th- and 17th-century Spain, which was thought to owe its prosperity and military might to the gold and silver of its New World colonies. This view gave rise to the theory that a favourable balance of trade would increase the nation’s supply of precious metals. Spain’s abundant treasure led it to buy goods and services abroad at the neglect of domestic industry, causing it to experience an economic decline.

Bullock, Wynn (b. April 18, 1902, Chicago. 111., U.S.— d. Nov. 16, 1975, Monterey, Calif.) U.S. photographer. He was strongly influenced in his early work — mainly “solarizations,” in which the image is partly negative and partly positive — by the avant-garde experiments of LAszlo Moholy-Nagy. In 1948 Edward Weston persuaded him to focus on real-

ism and tonal beauty, and Bullock followed his advice so closely that his images often resembled Weston’s. He is best known for realistic images that are meant to be viewed as “equivalents,” or visual metaphors (e.g., the passing of time, the inevitability of death).

Bulow VbiE-loV Bernhard (Heinrich Martin Karl), prince von

(b. May 3, 1849, Klein-Flottbek, near Altona, Ger. — d. Oct. 28, 1929, Rome, Italy) German imperial chancellor and Prussian prime minister (1900-09). After holding a number of diplomatic posts, he was appointed state secretary for the foreign department in 1897. He quickly became a potent force and succeeded to the chancellorship in 1900. In cooperation with William II, he pursued a policy of German aggrandizement in the years preceding World War I. He was unable to prevent the formation of the

Manolete executing a natural pass, a close pase with his left hand.

BARNABY CONRAD

Common bullfinch (Pyrrhula pyrrhula)

H.M. BARNFATHER/BRUCE COLEMAN LTD.

Bullfrog (Rana catesbeiana)

RICHARD PARKER

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English-French-Russian alliance against Germany (see Entente Cordiale; Triple Entente) and increased international tension with the first of the Moroccan crises.

Bulow \'biE-lo\, Hans (Guido), baron von (b. Jan. 8, 1830, Dresden, Saxony — d. Feb. 12, 1894, Cairo, Egypt) German conductor and pianist. He studied piano with Clara Schumann’s father. His meetings with the composers Franz Liszt (1849) and Richard Wagner (1850) led to his decision to give up law for music, and with their help he launched a renowned career as conductor and pianist, studying with Liszt from 1851 and marrying his daughter Cosima in 1857. He was appointed court conductor to Louis II and later director of the Munich Conservatory. He conducted the premieres of Wagner’s operas Tristan und Isolde (1859) and

Die Meistersinger (1868). Cosima abandoned von Biilow for Wagner, whom she married in 1870; nonetheless, von Biilow continued to promote Wagner's music. He was one of the first conductors to conduct from memory; his interpretations were noted for their integrity and emotional power.

bulrush Any of the annual or perennial grasslike plants constituting the genus Scirpus, especially S. lacustris, in the sedge family, that bear solitary or much-clustered spikelets. Bulrushes grow in wet locations, including ponds, marshes, and lakes. Their stems are often used to weave strong mats, baskets, and chair seats. Bulrushes may act as a filter, absorbing poisonous metals and toxic microorganisms, thus helping to reduce water pollution. In Britain, the term bulrush refers to either of two CATTAILS (Typha latifolia and T. angustifolia).

Bultmann \'bult- 1 man\, Rudolf (Karl) (b. Aug. 20, 1884, Wiefelstede, Ger. — d. July 30, 1976, Marburg, W.Ger.) German Protestant theologian and New Testament scholar. The son of a Lutheran pastor, he studied at the University of Tubingen and later taught many years at Marburg (1921-51). He established his reputation with his analysis of the Gospels in History of the Synoptic Tradition (1921). Influenced by his colleague Martin Heidegger, he held that Christian faith should focus less on the historical Jesus and more on the transcendent Christ, and he examined the New Testament in mythical terms. During the Nazi era he supported the anti-Nazi Confessing Church. His postwar books included Kerygma and Myth (1953), History and Eschatology (1957), and Jesus Christ and Mythology (1960).

Bulwer, Sir (William) Henry Lytton (Earle) later Baron Dalling and Bulwer of Dalling (b. Feb. 13, 1801, London, Eng. — d. May 23, 1872, Naples, Italy) British diplomat. In the diplomatic service from 1829, he negotiated the Ponsonby Treaty (1838), which was advantageous to British trade with the Ottoman Empire. As ambassador to the U.S. (1849-52), he negotiated the controversial Clayton- Bulwer Treaty, which was intended to resolve (but in fact aggravated) Anglo-American disputes in Latin America. In 1856 he played a major part in the negotiations following the Crimean War. His brother was the novelist Edward Bulwer- Lytton.

Bulwer-Lytton, Edward (George Earl) later 1st Baron Lytton (of Knebworth) (b. May 25, 1803, London, Eng. — d. Jan. 18, 1873, Torquay, Devonshire) British politician, novelist, and poet. His first novel, Pelham, was published in 1828. He entered Parliament as a Liberal in 1831, retired in 1841, and returned in 1852 as a Tory. In the interim he wrote his long historical novels, including The Last Days of Pompeii, 3 vol. (1834), and Harold, the Last of the Saxon Kings (1848). He was created a peer in 1866. The opening to his 1830 novel Paul Clifford ("It was a dark and stormy night...") led to an annual Bulwer-Lytton Fiction Prize, in which entrants vie to create the most overwritten first sentence to a hypothetical novel.

bumblebee Any member of two genera constituting the insect tribe Bombini (family Apidae, order Hymenoptera), found almost worldwide but most common in temperate climates. Bumblebees are robust and hairy, average about 0.6-1 in. (1.5-2. 5 cm) in length, and are usually black with broad yellow or orange bands. Bombus species are nest builders, often nesting in the ground, commonly in deserted bird or mouse nests. They live in organized groups, with a queen, drones, and workers (see caste).

Psithyrus species are social parasites (see parasitism); they lay their eggs in Bombus nests, where the eggs and larvae are cared for by Bombus workers.

Bunau-Varilla \bLe-no-va-re-'ya\, Philippe (-Jean) (b. July 26, 1859, Paris, France — d. May 18, 1940, Paris) French engineer. He worked

for the French Panama Canal Co. (1884-89) until the project failed. He helped to instigate the revolution that resulted in Panamanian independence and was appointed by the provisional government to negotiate a treaty with the U.S. for the construction of a canal. In 1903 he signed a treaty with U.S. Secretary of State John Hay assuring the construction of the Panama Canal under U.S. control.

bunchberry Creeping perennial herbaceous plant (Cornus canadensis), also called dwarf cornel, of the dogwood family. The small and inconspicuous yellowish flowers, grouped in heads surrounded by four large and showy white (rarely pink) petal-like bracts, give rise to clusters of red fruits. Bunchberry is found in acid soils, bogs, and upland slopes in Asia and from Greenland to Alaska, and south as far as Maryland, New Mexico, and California.

Bunche VboqchV Ralph (Johnson) (b. Aug. 7, 1904, Detroit, Mich., U.S.— d. Dec. 9, 1971, New York,

N.Y.) U.S. diplomat. He earned graduate degrees at Harvard University and taught at Howard University from 1928. After studying colonial policy in Africa, he collaborated with Gunnar Myrdal in An American Dilemma (1944), a study of U.S. race relations. He worked in the U.S. war and state departments during World War II. In 1947 he became director of the trusteeship department of the UN Secretariat. His work in forging a truce between Palestinian Arabs and Jews earned him the 1950 Nobel Prize for Peace. As UN undersecretary for political affairs, he oversaw UN peacekeeping forces around the Suez Canal (1956), in the Congo (1960), and in Cyprus (1964). He also served on the board of the NAACP for 22 years.

Bundelkhand Vbun-dal-.kondV Historic region, central India. Long inhabited by various dynasties, it was finally settled by the Bundela Rajputs in the 14th century. For centuries afterward they engaged in warfare with the Muslim power of Delhi. After a period of Mughal rule, the Marathas extended their influence, but by 1817 the British government had acquired all territorial rights over the region. After Indian independence was achieved, Bundelkhand in 1948 merged into Vindhya Pradesh, which in turn merged with Madhya Pradesh in 1956.

Bundestag Vbun-d3s-,tak\ Lower house of the German bicameral legislature. It represents the nation as a whole and is elected by universal

suffrage under a system of mixed direct and proportional representation. Members serve four-year terms. The Bundestag in turn elects the chancellor. The term was formerly used to refer to the federal Diet of the German Confederation (1815-66), known as the Reichstag under the Weimar Republic (1919-34). Its building burned down in 1933 (see Reichstag fire), and its members were not allowed to meet again for the duration of the Nazi regime (1933-45). The Reichstag was reconstituted as the Bundestag in the governmental reorganization of 1949. Its membership was again reorganized after German unification in 1990.

bundle theory Theory advanced by David Hume to the effect that the mind is merely a bundle of perceptions without deeper unity or cohesion, related only by resemblance, succession, and causation. Hume's well-argued denial of a substantial or unified self precipitated a philosophical crisis from which Immanuel Kant sought to rescue Western philosophy.

Bundy, McGeorge (b. March 30, 1919, Boston, Mass., U.S. — d. Sept. 16, 1996, Boston) U.S. public official and educator. He served in World War II as an intelligence officer. He joined the faculty of Harvard University in 1949 and became dean of arts and sciences in 1953. As special assistant for national security to presidents John F. Kennedy and Lyndon B. Johnson, he was a forceful advocate of expanding U.S. involvement in the Vietnam War. He resigned to become president of the Ford Foundation (1966-79) and later taught at New York University (1979-89).

bungee jumping Vbon-jeV Sport in which the jumper falls from a high place with a rubber ("bungee") cord attached both to his or her feet and to the jump site, and, after a period of headfirst free fall, is bounced part-

Bunche.

H. ROGER-VIOLLET

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way back when the cord rebounds from its maximum stretch. It traces its roots to the "land diving" practiced on Pentecost Island, Vanuatu, in which divers jump off a high tower, their feet connected to it by a vine whose length is calculated to allow the jumper to fall until his hair just brushes the ground below. The Oxford Dangerous Sports Club, inspired by reports of the Pentecost Island divers, made the first Western bungee jumps, and bungee jumping was first offered commercially to the public in New Zealand in 1988.

Bunin Vbu-n y in\, Ivan (Alekseyevich) (b. Oct. 10, 1870, Voronezh, Russia — d. Nov. 8, 1953, Paris, France) Russian poet and novelist. He worked as a journalist and clerk while writing and translating poetry, but he made his name as a short-story writer, with such masterpieces as the title story of The Gentleman from San Francisco (1916). His other works

include the novel Mitya’s Love (1925), the story collection Dark Avenues (1943), fictional autobiography, memoirs, and books on Leo Tolstoy and Anton Chekhov. The first Russian awarded the Nobel Prize for Literature (1933), he is among the best stylists in the language.

Bunker Hill, Battle of also known as Battle of Breed's Hill (June 17, 1775) First major battle of the American Revolution. Within two months after the Battles of Lexington and Concord, more than 15,000 colonial troops assembled near Boston to prevent the British army from occupying several hills around the city, including Bunker and Breed’s hills. The colonists fortified Breed’s Hill in Charlestown, across the Charles River from Boston. They withstood a cannonade from British ships in Boston Harbor and fought off assaults by 2,300 British troops but were eventually forced to retreat. Although the British won the battle, it was a Pyrrhic victory that lent considerable encouragement to the revolutionary cause. British casualties (about 1,000) and the colonists’ fierce resistance convinced the British that subduing the rebels would be difficult.

bunraku \'bun-ra-ku\ Japanese traditional puppet theatre, in which nearly life-size dolls act out a chanted dramatic narrative, called joruri , to the accompaniment of a small samisen. Puppet theatre reached its height in the 18th century with the plays of Chikamatsu Monzaemon and declined later because of a lack of good joruri writers.

Bunsen, Robert (Wilhelm) (b. March 31, 1811, Gottingen, Westphalia — d. Aug. 16, 1899, Heidelberg, Baden) German chemist. With Gustav Robert Kirchhoff, he observed (c. 1859) that each element emits light of a characteristic wavelength, opening the field of spectrochemical analysis. They discovered several new elements (including helium, cesium, and rubidium) by spectroscopy. His only book discussed methods of measuring volumes of gases. He invented the carbon-zinc battery, grease-spot photometer (see photometry), filter pump, ice calorimeter, and vapour calorimeter. Though often credited with inventing the Bunsen burner, he seems to have made only a minor contribution to its development.

bunting Common name for any of about 37 Old World species (genus Emberiza) of finch, as well as certain similar species found in the New World. All belong to the family Fringillidae, and many are recognizable by strongly patterned heads or bright colours. Emberiza species are seed eaters that commonly breed in temperate Eurasia and from northern Africa to India. The snow bunting (Plectrophenax nivalis) breeds in the far north, and the lark bunting (Calamospiza melanocorys) inhabits the U.S. Great Plains. U.S. species include the indigo bunting (Passerina cyanea) and the painted bunting (P. ciris). The male painted bunting, with red, green, and blue feathers, is the most colourful bird that breeds in the U.S.

Bunuel \,bun-yu-'wel\, Luis (b. Feb. 22, 1900, Calanda, Spain — d. July 29, 1983, Mexico City, Mex.) Spanish film director. As a student at the University of Madrid he met Salvador Dau, with whom he later made the Surrealist film Un chien andalou (1928). Bunuel then directed the anti-

clerical L’Age d’or (1930) and the documentary Land Without Bread (1932). After working as a commercial producer in Spain and a technical adviser in Hollywood, he moved to Mexico, where he directed Los olvidados (1950) and Nazarin (1958). He returned to Spain to make Viridiana (1961), which was suppressed in Spain as anticlerical but internationally acclaimed. He attacked conventional morality in such later films as Belle de jour (1967), Tristana (1970), The Discreet Charm of the Bourgeoisie (1972), and That Obscure Object of Desire (1977).

Bunyan, John (b. November 1628, Elstow, Bedfordshire, Eng. — d. Aug. 31, 1688, London)

English minister and author. Bunyan encountered the seething religious life of various left-wing sects while serving in Oliver Cromwell’ s army in the English Civil Wars. He underwent a period of spiritual crisis, converted to Puritanism, and became a preacher. After the Restoration, he was jailed as a Nonconformist for 12 years, during which he wrote his spiritual autobiography, Grace Abounding (1666). He is best known for The Pilgrim’s Progress (1678-84), a religious allegory expressing the Puritan religious outlook. A symbolic vision of the character Christian’s pilgrimage through life, it was at one time second only to the Bible in popularity among ordinary readers. Despite his ministerial responsibilities, he published numerous works in his last 10 years.

Bunyan, Paul Legendary giant lumberjack of the U.S. frontier. A symbol of strength and vitality, he is accompanied by a giant blue ox, Babe. He was credited with creating Puget Sound, digging the Grand Canyon, and building the Black Hills, and was known for his prodigious appetite, eating hotcakes off a griddle so large it was greased by men using sides of bacon as skates. Tales of his exploits probably originated in lumber camps, and were first published by James MacGillivray in “The Round River Drive” (1910), which soon led to a national myth.

Bunyoro See Nyoro

Buonarroti, Michelangelo See Michelangelo
buoyancy See Archimedes' principle

burakumin \bu- , ra-ku-min\ Japanese "hamlet people" Japanese minority group that suffers discrimination based on its historical outcaste status. In the late 16th century, when Toyotomi Hideyoshi divided the populace into four social classes, one group remained outside and beneath the system: those whose occupation involved the taking of life (such as butchers or executioners) or handling flesh or dead bodies (such as leatherworkers or gravediggers). Buddhist and Shinto beliefs in the polluting nature of these occupations have long stigmatized those who held them. Though their outcaste status was removed by law in 1871, prejudice remains, and burakumin heritage often stands in the way of marriages and employment opportunities. Burakumin are estimated to number 1-3 million.

Burbage Vbor-bijV Richard (b. c. 1567, London, Eng. — d. March 9/13, 1619, London) British actor. A popular actor by age 20, he was a member of the Earl of Leicester's company and the Chamberlain's (later King's) Men. Closely associated with William Shakespeare, he was the first to play roles such as Richard III, Romeo, Henry V, Hamlet, Macbeth, Othello, and King Lear. He also performed in plays by Thomas Kyd, Ben Jonson, and John Webster. He was a major shareholder of the Globe Theatre and the Blackfriars Theatre.

Burbank, Luther (b. March 7, 1849, Lancaster, Mass., U.S. — d. April 11, 1926, Santa Rosa, Cal.) U.S. plant breeder. He was reared on a farm and never obtained a college education. Influenced by Charles Darwin's writings on domesticated plants, he began a plant-breeding career at age 21. On the proceeds of his rapid development of the hugely successful Burbank potato, he set up a nursery garden, greenhouse, and experimen-

Painted bunting (Passed na ciris)

DONALD D. BURGESS FROM E.R. DEGGINGER-EB INC.

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tal farms in Santa Rosa, Cal. There he developed more than 800 new and useful strains and varieties of fruits, flowers, vegetables, grains, and grasses, many of which are still commercially important. His laboratory became world-famous, and he helped make plant breeding a modem science. He published two multivolume works and a series of

descriptive catalogs.

Burbidge, (Eleanor) Margaret orig. Eleanor Margaret Peachey (b. Aug. 12, 1919, Davenport, Cheshire, Eng.) English astronomer. She served as acting director (1950-51) of the Observatory of the University of London. In 1955 her husband, Geoffrey Burbidge (b. 1925), became a researcher at the Mount Wilson Observatory, and she accepted a research post at Caltech. She later joined the faculty at UC-San Diego, briefly serving as director of the Royal Greenwich Observatory (1972-73). Jointly with her husband, she made notable contributions to the theory of quasars and to the understanding of how the elements are formed in the depths of stars through nuclear fusion (nucleosynthesis).

burbot Vbsr-bstX Elongated fish (Lota lota), the only freshwater member of the cod family. It lives in cold rivers and lakes of Europe, Asia, and North America. A mottled, greenish or brown bottom-dweller, it descends as deep as 700 ft (200 m). It may grow about 3.6 ft (1.1 m) long. It has very small, embedded scales, a long anal fin, and two dorsal fins. The burbot is valued as food in some areas.

Burchfield, Charles (Ephraim) (b. April 9, 1893, Ashtabula Harbor, Ohio, U.S. — d. Jan. 10, 1967, Gardenville, N.Y.) U.S. painter. He attended the Cleveland School of Art and, after service in World War I, worked as a wallpaper designer in Buffalo, N.Y. In the 1920s and ’30s he was one of the leading painters of American life; his work was associated with Edward Hopper’s in its portrayal of the loneliness and bleakness of small-town life (e.g., November Evening , 1934). In the 1940s he abandoned realism for a more personal interpretation of nature, emphasizing its mystery, movement, and colour from season to season (e.g.. The Sphinx and the Milky Way, 1946).

Burckhardt Vburk-.harA, Jacob (Christopher) (b. May 25, 1818, Basel, Switz. — d. Aug. 8, 1897, Basel) Swiss historian of art and culture. After abandoning his study of theology, Burckhardt studied art history, then a new field, at the University of Berlin (1839-43). As he matured he became a cultural conservative, alienated from the contemporary world and preoccupied with reclaiming the past. From 1 843 he taught primarily at the University of Basel; from 1886 until his retirement in 1 893 he taught art history exclusively. He is famous for The Civilization of the Renaissance in Italy (1860), which examines daily life in the Renaissance in terms of such phenomena as the development of individuality and the modern sense of humour; it became a model for cultural historians. He died while working on a four-volume survey of Greek civilization.

burdock Any plant of the genus Arctium, in the composite family, bearing globular flower heads with prickly bracts. Native to Europe and Asia, burdock species have been naturalized throughout North America. Regarded as weeds in the U.S., they are cultivated for their edible root in Asia. Their fruits are round burrs that stick to clothing and fur.

Bureau of Standards since 1988 U.S. National Institute of

Standards and Technology (NIST) Agency of the U.S. Department of Commerce responsible for the standardization of weights and measures, timekeeping, and navigation. Active since at least the mid- 19th century, the agency works closely with the U.S. Naval Observatory and the Bureau International de l'Heure in Paris to ensure global standardized time.

bureaucracy Professional corps of officials organized in a pyramidal hierarchy and functioning under impersonal, uniform rules and proce-

dures. Its characteristics were first formulated systematically by Max Weber, who saw in the bureaucratic organization a highly developed division of labour, authority based on administrative rules rather than personal allegiance or social custom, and a "rational" and impersonal institution whose members function more as "offices" than as individuals. For Weber, bureaucracy was a form of legalistic "domination" inevitable under capitalism. Later writers saw in bureaucracy a tendency to concentrate power at the top and become dictatorial, as occurred in the Soviet Union. Robert K. Merton emphasized its red tape and inefficiency due to blind conformity to procedures. More recent theories have stressed the role of managerial cliques, occupational interest groups, or individual power-seekers in creating politicized organizations characterized by internal conflict.

Burgas \bur-'gas\ City (pop., 2001: 802,932), eastern Bulgaria. Located on an inlet of the Black Sea, it is one of Bulgaria's chief ports. It was founded in the 17th century; its development received impetus with the coming of the railroad in the late 19th century. It claims much of Bulgaria's Black Sea trade and handles most of its fish catch. With several neighbouring towns, Burgas is part of the developing Black Sea Riviera.

Burger VblEr-goA, Gottfried August (b. Dec. 31, 1747, Molmerswende bei Halberstadt, Brandenburg — d. June 8, 1794, Gottingen, Hanover) German poet. He was associated with the Gottinger Hain, a circle of Sturm und Drang poets who reawakened interest in folk and nature themes. His bizarre ballad "Lenore" (1773) had a profound effect on the subsequent development of literary Romanticism throughout Europe, and he is remembered as a founder of German Romantic ballad literature. He is also noted for his Petrarchan sonnets and translations from English, especially Thomas Percy's Reliques of Ancient English Poetry.

Burger, Warren E(arl) (b. Sept. 17, 1907, St. Paul, Minn., U.S. — d. June 25, 1995, Washington, D.C.) U.S. jurist. He graduated with honours from St. Paul (now William Mitchell) College of Law in 1931, after which he joined a prominent law firm and became active in the Republican Party. He was appointed an assistant U.S. attorney general (1953) and named to the U.S. Court of Appeals for the District of Columbia (1955), where his conservative approach commended him to Pres. Richard Nixon, who nominated him for chief justice of the Supreme Court of the United States in 1969. Contrary to the expectations of some, he did not try to reverse the liberal decisions on civil-rights issues and criminal law made during the tenure of his predecessor, Earl Warren. Under his leadership, the court upheld the 1966 Miranda v. Arizona decision, permitted busing as a means of ending racial segregation in public schools, and endorsed the use of racial quotas in the awarding of federal grants and contracts. Burger voted with the majority in Roe v. Wade (1973). Keenly interested in judicial administration, he became deeply involved in efforts to improve the judiciary's efficiency. He retired in 1986 and was awarded the Presidential

Medal of Freedom in 1988.

Burgess Vbsr-jasV Anthony orig. John Anthony Burgess Wilson (b. Feb. 25, 1917, Manchester, Eng. — d. Nov. 22, 1993, London) English novelist, critic, and composer. His experiences in Southeast Asia produced the novel trilogy The Long Day Wanes (1956-59). A Clockwork Orange (1962; film, 1971), his most original work, is a satire on extreme political systems. His other novels, which combine mordant wit, moral seriousness, verbal dexterity, and the bizarre, include The Wanting Seed (1962), Inside Mr. Enderby (1963), and Earthly Powers (1980). In addition to his extensive literary criticism, biographies, and works on linguistics and music, he composed more than 65 musical works.

Burgess Vbar-jssX, Guy (Francis de Money) (b. 1911, Devonport, Devon, Eng. — d. Aug. 30, 1963, Moscow, Russia, U.S.S.R.) British diplomat and Soviet spy. At the University of Cambridge in the 1930s, he became part of a group of young men, including Donald Maclean (1913—83), who shared a disdain for capitalist democracy. They were recruited by Soviet intelligence operatives and supplied information from their positions, mainly in the British foreign office (Maclean from 1934, Burgess from 1944). Maclean's post with the British embassy in Washington, D.C., enabled him to pass secret information about NATO to the Soviets; Burgess also served in Washington. In 1951 both men were warned by their colleague Kim Philby that an investigation was closing in on Maclean. With the aid of Anthony Blunt, they fled England and vanished, then surfaced in Moscow in 1956.

Burgess Vbsr-jasV Thornton W(aldo) (b. Jan. 14, 1874, Sandwich, Mass., U.S. — d. June 5, 1965, Hampden, Mass.) U.S. children's author and naturalist. He loved nature as a child. His first book. Old Mother West

Burbank

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Wind (1910), introduced the animal characters that were to populate his subsequent stories, which were published in many languages. He promoted conservationism through his "Wildlife Protection Program," his "Radio Nature League," and other organizations. He wrote more than 170 books and 15,000 stories for newspaper columns.

Burgess Vbor-josX Shale Fossil formation containing remarkably detailed traces of soft-bodied marine organisms of the middle of the Cambrian Epoch (520-512 million years ago). Collected from a fossil bed in

the Burgess Pass of the Canadian Rockies, the Burgess Shale is one of the best preserved and most important fossil formations in the world. Since it was discovered in 1909, over 60,000 specimens have been retrieved from the bed.

Burgesses Vbor-jas-ozV House of Representative assembly in colonial Virginia, the first elective governing body in a British colony. It was one division of the legislature established in 1619 by the colonial governor at Jamestown; the other included the governor himself and a council, all appointed by the colonial proprietor (the Virginia Company). Each Virginia settlement was entitled to elect two delegates, or burgesses (citizens of a borough in England). See also London Co.

Burghley, Baron See William Cecil

burglary Crime of breaking into and entering a structure with the intent to commit a felony within (see felony and misdemeanour). It is one of several crimes in the general category of theft. Some state statutes specify degrees of burglary based on when and where the crime occurs, whether anyone is present in the structure when it is broken into, and whether a deadly weapon is used.

Burgoyne Vbor-'goinX, John (b. 1722, Sutton, Bedfordshire, Eng. — d. June 4, 1792, London) British general. After serving in the Seven Years' War he was elected to the British House of Commons in 1761 and 1768. Assigned to Canada in 1776, he began a campaign to join British forces from the north, south, and west to isolate the rebellious New England colonies. In 1777 his army captured Fort Ticonderoga, N.Y., but was stopped at the Hudson River by a larger army of colonists under Horatio Gates and Benedict Arnold. After several months of fighting, he surrendered to Gates at Saratoga Springs, N.Y.; he returned to England to face criticism for his defeat.

Burgundian school Group of 15th-century French composers, most of whom were associated with courts of various dukes of Burgundy. They are best known for their three-part chansons in rondeau form (see formes fixes), usually with text only in the highest part — perhaps implying a solo voice accompanied by instruments, written in full triadic harmony. The most important Burgundian composers were Guillaume Dufay, Gilles Binchois (c. 1400-60), and Antoine Busnois (c. 1430-92).

Burgundy French Bourgogne \biir-'g6n y \ Historical and governmental region, France. The name was originally applied to a kingdom in the Rhone valley and western Switzerland founded by the Burgundians, a Germanic people who fled Germany in the 5th century. Conquered by the Merovingians c. 534, it was incorporated into the Frankish empire. By the 843 Treaty of Verdun, which divided the empire of Charlemagne, it was included in the Middle Kingdom of Lothar I. It was later divided into Cisjurane (Lower) Burgundy, or Provence (founded 879), and Transjurane (Upper) Burgundy (founded 888); they united in 933 to form the kingdom of Burgundy. After the 13th century, it was known as the kingdom of Arles; the name Burgundy was applied to the duchy of Burgundy, formed in the 9th century from lands in the northwestern part of the original kingdom. On the death of Burgundy's duke in 1361, the duchy reverted to the French crown. Given to Philip II, by 1477 its lands extended into the Low Countries. It was seized by Louis XI, annexed to the French crown, and was a province until the French Revolution. Roughly coextensive with the pre-Revolutionary province, the current administrative

region of Burgundy (1999: 1,610,067) covers 12,194 sq mi (31,582 sq km). Its capital is Dijon. Wine making is an important part of the economy.

burial Ritual disposal of human remains. The practice is often intended to facilitate the deceased's entry into the afterworld. Grave burial dates back at least 125,000 years. Types of graves range from trenches to large burial mounds to great stone tombs such as pyramids. Caves have also long been used for the dead — e.g., in ancient Hebrew burials, the sepulchral caves (rock temples) of western India and Sri Lanka, and the Dogon cliff burial sites. Water burial, such as occurred among the Vikings, has also been common. Cremation and the scattering of ashes on water is widely

practiced, especially in Asia; in India the remains of the deceased are thrown into the sacred Ganges River. Some peoples (American Indian groups, Parsis, etc.) employ exposure to the elements to dispose of their dead. Among many peoples, the first burial is followed by a second, after an interval that often coincides with the duration of bodily decomposition. This reflects a concept of death as slow passage from the society of the living to that of the dead. Jewish custom requires speedy burial; a prayer known as the Kaddish is recited at the graveside, and a gravestone is normally erected a year after burial. Christian burials are often preceded by a wake, a "watch" held over the deceased's body and sometimes accompanied by festivity. Bodies of Muslims are laid on their right side and facing Mecca.

Buridan \bH-re- l da n ,\ English \'byur-3d- 3 n\, Jean (b. 1300, Bethune?, France — d. 1358) French philosopher, logician, and scientific theorist. He studied under William of Ockham at the University of Paris and later taught there. According to his modified version of determinism, though one must choose what presents itself as the greater good, the will is free to delay reason's judgment by suggesting a more thorough inquiry into the worth of one's motives. The dilemma of a particular kind of moral choice, between two evidently identical alternatives, is illustrated by the celebrated allegory of "Buridan' s ass." Among his achievements in mechanics was a revision of Aristotle's theory of motion; he developed a theory of impetus by which the mover imparts to the moved a power, proportional to the former's speed and mass, which keeps it moving. His studies of optical images prefigured modern developments in cinematics. In logic he explicated the doctrines of Aristotle and Peter of Spain (c. 1210—77). His works include Summula de dialecta (1487) and Consequents (1493).

Burke, Edmund (b. January 127, 1729, Dublin, Ire. — d. July 9, 1797, Beaconsfield, Buckinghamshire, Eng.) British parliamentarian, orator, and political philosopher. The son of a lawyer, he began legal studies but lost interest, became estranged from his father, and spent some time wandering about England and France. Essays he published in 1757-58 gained the attention of Denis Diderot, Immanuel Kant, and Gotthold Lessing, and he was hired to edit a yearly survey of world affairs (1758-88). He entered politics (1765) as secretary to a Whig leader and soon became involved in the controversy over whether Parliament or the monarch controlled the executive. He argued (1770) that George Ill's efforts to reassert a more active role for the crown violated the constitution's spirit. Elected to Parliament (1774-80), he contended that its members should exercise judgment rather than merely follow their constituents' desires. Although a strong constitutionalist, he was not a supporter of pure democracy; although a conservative, he eloquently championed the cause of the

American colonists, whom he regarded as badly governed, and he supported the abolition of the international slave trade. He tried unsuccessfully to legislate relief for Ireland and to reform the governance of India. He disapproved of the French Revolution for its leaders' precipitous actions and its antiaristocratic bloodshed. He is often regarded as the founder of modern conservatism.

Burkina Faso \bur-'ke-n9-'fa-so\ formerly Upper Volta Country, West Africa. A landlocked country, it lies south of the Sahara Desert. Area: 103,456 sq mi (267,950 sq km). Population (2005 est.): 13,492,000. Capital: Ouagadougou. Ethnic groups are the Mossi, Hausa, Fulani, Mande, Bobo, and Senufo. Languages: French (official), Mossi, Dyula, Fula. Religions: Islam, traditional beliefs, Christianity. Currency: CFA franc. Burkina Faso consists of an extensive plateau characterized by a savanna, grassy in the north and sparsely forested in the south. The plateau is notched by the valleys of the Mouhoun (Black Volta), Nazinon (Red Volta), and Nakanbe rivers, which flow south into Ghana. The economy is largely agricultural. Burkina Faso is a republic with one legislative body; its chief of state is the president and its head of government the prime minister. Probably in the 14th century, the Mossi and Gurma peoples established themselves in eastern and central areas. The Mossi kingdoms of Yatenga and Ouagadougou existed into the early 20th century. A French protectorate was established over the region (1895-97), and its southern boundary was demarcated through an Anglo-French agreement. It was part of the Upper Senegal-Niger (see Mali) colony, then became a separate colony in 1919. It was constituted an overseas territory within the French Union in 1947, became an autonomous republic within the French Community in 1958, and achieved total independence in 1960. Since then it has been ruled primarily by the military and has experienced several coups; the country received its present name in 1984. A

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ning of the 21st century.

Burkitt, Denis P(arsons) (b. Feb. 28, 1911, Enniskillen, N.Ire. — d. March 23, 1993, England) British surgeon and medical researcher. He discovered Burkitt lymphoma, a lethal cancer of the lymphatic system with a high incidence among children. He showed that it was common in equatorial African regions where malaria and yellow fever are endemic and linked it to Epstein-Barr virus in children with immune systems depressed by chronic malaria. He later helped develop an effective chemotherapy treatment. Burkitt was also known for his theory that a high-fibre diet protects against colon cancer, publicized in his book Don't Forget Fibre in Your Diet (1979).

burlesque In literature, comic imitation of a serious literary or artistic form that relies on an extravagant incongruity between a subject and its treatment. It is closely related to parody, though burlesque is generally

broader and coarser. Early examples include the comedies of Aristophanes. English burlesque is chiefly drama. John Gay’s The Beggar’s Opera (1728), Henry Fielding’s Tom Thumb (1730), and Richard Brinsley Sheridan’s The Critic (1779) are parodies of popular dramatic forms of the period. Victorian burlesque, usually light entertainment with music, was eclipsed by other popular forms by the late 19th century, and burlesque eventually came to incorporate and be identified with striptease acts (see burlesque show).

burlesque show Stage entertainment composed of slapstick sketches, bawdy humour, chorus numbers, and solo dances. Introduced in the U.S. in 1868 by a company of English chorus girls, it developed as a version of the minstrel show, divided into three parts: (1) a series of coarse humorous songs, slapstick sketches, and comic monologues; (2) the olio, or mixture of variety acts (e.g., acrobats, magicians, singers); and (3) chorus numbers and occasionally a takeoff, or burlesque, on politics or a current play. The show ended with an exotic dancer or a boxing match. In the early 20th century, many performers, including Fanny Brice, Al Jolson, and W.C. Fields, began their careers in burlesque. The addition of the striptease in the 1920s made a star of Gypsy Rose Lee, but censorship and competition from motion pictures soon led to burlesque’s decline.

Burlingame, Anson (b. Nov. 14, 1820, New Berlin, N.Y., U.S. — d. Feb. 23, 1870, St. Petersburg, Russia) U.S. diplomat. He served in the U.S. House of Representatives (1855-61) and helped found the Republican Party. As U.S. minister to China (1861-67), he implemented a policy of cooperation between China and the Western powers. He so impressed the Chinese government that in 1867 he was appointed imperial envoy to conduct China’s international relations. He concluded the Burlingame Treaty, which established reciprocal rights of Chinese and U.S. citizens.

Burlington City (pop., 2000: 38,889), northwestern Vermont, U.S.

Lying on a hillside sloping toward Lake Champlain, it is the largest city in the state and a port of entry. Chartered by Gov. Benning Wentworth of New Hampshire in 1763, it was named for the Burling family, who were pioneer landowners. Settlement began in 1773. Later it was a military post; in the War of 1 8 1 2 it saw several engagements between land batteries and British warships on the lake. It was the home of Ethan Allen.

It is the seat of the University of Vermont. Shelburne Museum, a reconstruction of early American life, is nearby.

Burma See Myanmar

Burma Road Highway, South Asia. It runs 717 mi (1,154 km) from Lashio (in eastern Burma, now Myanmar) northeast to Kunming (in Yunnan, China). An extension runs east through China from Kunming, then north to Chongqing. Completed in 1939, it functioned as a supply route to the interior of China, carrying war goods. It was seized by the Japanese in 1942 and reopened when it was connected to the Stilwell Road from India. Its importance diminished after World War II, but it has remained a link in a 2,100-mi (3,400-km) road system from Yangon, Myanmar, to Chongqing.

Burmese cat Breed of domestic cat, presumably of Asian origin. Compactly built, it has a small, rounded head and wide-set, round, yellow eyes. The short, finely textured, glossy coat darkens as it matures from milk-chocolate to a rich sable brown and is paler on the underside; the ears, face, legs, and tail may be darker. The tapered tail may be kinked near the tip.

burn Damage caused to the body by contact with flames, hot substances, some chemicals, radiation (including sunlight), or electricity. Bums are classified by depth of skin damage and by percentage of skin damaged. First-degree burns injure only the epidermis (top layer), with redness, pain, and minimal edema. In a second-degree burn, damage extends into the dermis (inner layer), with redness and blisters. Third-degree burns destroy the entire thickness of the skin. There is no pain, because the skin’s pain receptors are destroyed. Burns deeper than the skin can release toxic materials into the bloodstream and may require amputation. Secondary shock follows severe bums, caused by loss of fluid both in the destroyed tissue and in leaks from the damaged area. Treatment depends on severity; first-degree bums need only first aid; third-degree burns require long-term hospitalization. Depending on the type, extent, and site of the burn, it may be left exposed, covered with a bandage, or excised to remove dead tissue in preparation for skin grafts. Complications of bums include respiratory problems, infection, ulcers in the stomach or duodenum, and, especially in brown skin, thick scarring. Seizures and hypertension after bums occur almost entirely in children. Survivors usually require plastic surgery, long-term physical therapy, and psychotherapy.

Burnaby District municipality (pop., 2001: 193,954), southwestern British Columbia, Canada. The settlement developed along with Vancouver in the late 19th century and is now an eastern suburb of that city. It is one of the province’s chief commercial and industrial centres, with important trucking, warehousing, and petroleum-distribution facilities.

Burne-Jones Vborn-'jonzV Sir Edward (Coley) (b. Aug. 28, 1833, Birmingham, Eng. — d. June 17, 1898, London) British painter, illustrator, and designer. At Oxford he met his future collaborator, William Morris. In 1856 he became apprenticed to Dante Gabriel Rossetti. His paintings portray the romantic medieval imagery favoured by the Pre-Raphaelites, and he drew inspiration from the elongated, melancholy figures of Fra Filippo Lippi and Sandro Botticelli. He first achieved great success in 1877

Burlingame, detail of an engraving by Perine & Giles, late 1 9th century.

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with an exhibition of paintings including The Beguiling of Merlin (1873–77). He was a founding member of Morris & Co. (1861), notably as a designer of stained glass and tapestries, and he executed 87 designs for the Kelmscott Press edition of Geoffrey Chaucer (1896), considered one the world's finest printed books. His work had great influence on the French Symbolist movement, and his revival of the ideal of the artist-craftsman influenced the development of 20th-century industrial design.

Burnet \bar-'net\, Sir (Frank) Macfarlane (b. Sept. 3, 1899, Traralgon, Vic., Austl. – d. Aug. 31, 1985, Melbourne, Vic.) Australian physician and virologist. Burnet received his medical degree from the University of Melbourne. He later discovered a method for identifying bacteria by the viruses (bacteriophages) that attack them, and he shared a 1960 Nobel Prize with Peter Medawar for the discovery of acquired immunological tolerance to tissue transplants. He was knighted in 1951.

Burnett, Carol (b. April 26, 1933, San Antonio, Texas, U.S.) U.S. comedian and actress. She made her Broadway debut in Once upon a Mattress (1959), then appeared regularly on television in The Garry Moore Show (1959-62). Her gift for parody and her knock-kneed comic grace gained her a wide following. The weekly Carol Burnett Show (1966-77) became one of television's most popular programs and won her five Emmy Awards. She acted in several films, including Pete 'n ' Tillie (1972) and Annie (1982), and returned to Broadway in Moon over Buffalo (1995).

Burnett, Frances (Eliza) Hodgson (b. Nov. 24, 1849, Manchester, Eng. – d. Oct. 29, 1924, Plandome, N.Y., U.S.) British-U.S. playwright and author. She is best remembered for the popular children's novel Little Lord Fauntleroy (1886), about an American boy who inherits an English earldom. The Secret Garden (1911), considered her best work, is a classic of children's literature. Other works include the novel Through One Administration (1 883), about corruption in Washington, D.C., and the play A Lady of Quality (1896).

Burney, Charles (b. April 7, 1726, Shrewsbury, Shropshire, Eng. – d. April 12, 1814, Chelsea, Middlesex) British music historian. After being apprenticed to Thomas Arne, he taught music and played the organ. In 1770 he set off on European travels, undertaken to research his seminal General History of Music, 4 vol. (1776-89). His accounts of the many famous musicians and others he met, including Christoph Willibald Gluck and Carl Philipp Emanuel Bach, provide an entertaining and invaluable account of 18th-century European musical life and of intellectual life in general. The novelist Fanny Burney was his daughter.

Burney (d'Arblay), Fanny orig. Frances Burney (b. June 13, 1752, King's Lynn, Norfolk,

Eng. — d. Jan. 6, 1840, London)

English novelist. The self-educated daughter of Charles Burney, she wrote lively accounts of his social musical evenings. Her habit of recording observations of society led to Evelina (1778), an epistolary novel about an unsure young girl's social development; a landmark in the evolution of the novel of manners, it pointed the way to Jane Austen's novels. Her later novels include Cecilia (1782) and the potboiler Camilla (1796).

Burnham, Daniel H(udson)

(b. Sept. 4, 1846, Henderson, N.Y.,

U.S.— -d. June 1, 1912, Heidelberg,

Ger.) U.S. architect and city planner.

He pioneered the development of Chicago commercial architecture with his partner, John Wellborn Root (1850-91). Three of the firm's Chicago buildings were designated landmarks in 1962: the Rookery (1886), the Reliance Building (1890), and the Monadnock Building (1891), the last and tallest (16-story) U.S. masonry skyscraper. As chief consulting architect for Chicago's World's Columbian Exposition (1893), Burnham chose firms working in academic eclecticism, the antithesis of the Chicago School. The exposition's resulting "White City," with its boulevards, gardens, and Classical facades, influenced subsequent planning in the U.S.

Burnham's plan for Chicago (1907-09), which the city used for many years, is a classic example of U.S. city planning.

Burns, George orig. Nathan Birnbaum (b. Jan. 20, 1896, New York, N.Y., U.S. — d. March 9, 1996, Beverly Hills, Calif.) U.S. comedian best known for his collaboration with Grade Allen (1902-64). Bums and Allen formed a comedy team in 1925 and were married in 1926. They performed on radio in The George Burns and Grade Allen Show (1932—50), with Bums playing the straight man to Allen's malaprop-prone chatterbox, before their show moved to television (1950-58). They made 13 films together, including The Big Broadcast films of 1932, 1936, and 1937. Burns returned to the screen in films such as The Sunshine Boys (1975, Academy Award) and Oh, God! (1977) and its sequels. Famous for his wry humour and his cigars, he continued performing into his late 90s.

Burns, Ken(neth Lauren) (b. July 27, 1953, Brooklyn, N.Y., U.S.) U.S. documentary filmmaker. He founded his own production company in 1975 and made such documentary films as Brooklyn Bridge (1981), The Shakers (1984), The Statue of Liberty (1985), and The Congress (1988). His acclaimed series The Civil War (1990), televised on PBS, won

numerous filmmaking and history awards. His later television documentaries include Baseball (1994), Lewis and Clark (1997), Frank Lloyd Wright (1998), and Jazz (2001).

Burns, Robert (b. Jan. 25, 1759, Alloway, Ayrshire, Scot. — d. July 21, 1796, Dumfries, Dumfriesshire)

National poet of Scotland. The son of a poor farmer, he early became familiar with orally transmitted folk song and tales. His father's farm failed, and a farm he started himself quickly went bankrupt. Handsome and high-spirited, he engaged in a series of love affairs, some of which produced children, and celebrated his lovers in his poems. His Poems,

Chiefly in the Scottish Dialect (1786) brought acclaim but no financial security, and he eventually took a job as an exciseman. He later began collecting and editing hundreds of traditional airs for James Johnson's Scots Musical Museum (1787—1803) and George Thomson's Select Collection of Original Scotish Airs (1793-1818); he substantially wrote many of these songs, though he did not claim them or receive payment for them. Among his best-known songs are "Auld Lang Syne," "Green Grow the Rashes, O," "John Anderson My Jo," "A Red, Red Rose," and "Ye Banks and Braes o' Bonnie Doon." He freely proclaimed his radical opinions, his sympathies with the common people, and his rebellion against orthodox religion and morality.

Burnside, Ambrose (Everett) (b. May 23, 1824, Liberty, Ind., U.S. — d. Sept. 13, 1881, Bristol, R.I.) Union general in the American Civil War. A graduate of West Point, he was promoted to major general in 1862 and replaced George B. McClellan as commander of the Army of the Potomac; he was himself replaced after the Union loss at the Battle of Fredericksburg. He resigned in 1864 after the "Burnside mine" fiasco in the Petersburg Campaign, when a mine explosion intended to damage Confederate troops resulted in heavy Union losses. He was governor of Rhode Island (1866-69) and a U.S. senator (1875-81). He originated the fashion of side whiskers, later known as "sideburns."

Burnt Njall See Njals saga

Burr, Aaron (b. Feb. 6, 1756, Newark, N.J. — d. Sept. 14, 1836, Port Richmond, N.Y., U.S.) U.S. politician, third vice president of the U.S. (1801-05). He served in the American Revolution on George Washington's staff until 1779. He had a successful law practice in New York from 1782 and served as state attorney general (1789-91) and in the U.S. Senate (1791-97). In 1800 he won the vice presidential nomination on the Jeffersonian Republican ticket. In the election, he and Thomas Jefferson received the same number of electoral college votes; under procedures then prevailing, the electors had cast their votes for both Jefferson and Burr without indicating which should be president and which vice presi-

dent. The election went to the House of Representatives, which became

Fanny Burney, detail of an oil painting by her brother, E.F. Burney; in the National Portrait Gallery, London

COURTESY OF THE NATIONAL PORTRAIT GALLERY, LONDON

Robert Burns, detail of an oil painting by Alexander Nasmyth; in the National Portrait Gallery, London.

COURTESY OF THE NATIONAL PORTRAIT GALLERY,

LONDON

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deadlocked. Jefferson eventually was chosen president after Alexander Hamilton endorsed him; Burr became vice president. Burr resented Hamilton's action and his later effort to block Burr's nomination for governor of New York in 1804. Following some remarks by Hamilton about Burr's character, Burr challenged him to a duel, in which Hamilton was mortally wounded. Burr fled to Philadelphia, where with Gen. James Wilkinson he planned an invasion of Mexico. He was tried for treason in 1807 before John Marshall, whose narrow interpretation of the constitutional charge led to acquittal. Under a cloud, Burr left for Europe, where he tried in vain to interest English and French authorities in his scheme to conquer Florida. In 1812 he returned to New York to resume his law practice.

burro See donkey

Burroughs, Edgar Rice (b. Sept. 1, 1875, Chicago, 111., U.S. — d. March 19, 1950, Encino, Calif.) U.S. novelist. Burroughs worked as an advertising copywriter before trying fiction. His jungle adventure novel Tarzan of the Apes (1914) became the first of 25 books featuring Tarzan, the son of an English nobleman abandoned in Africa and raised by apes. He wrote 43 other novels.

Burroughs, John (b. April 3, 1837, near Roxbury, N.Y., U.S. — d. March 29, 1921, en route from California to New York) U.S. essayist and naturalist. In his early years he worked as a teacher, farmer, and U.S. Treasury Department clerk. In 1873 he moved to a farm in the Hudson River valley. Traveling extensively, he hiked and camped with John Muir and

Theodore Roosevelt, among other friends, and accompanied an expedition to Alaska. His many books helped establish the genre of the nature essay; they include Wake-Robin (1871), Birds and Poets (1877), Locusts and Wild Honey (1879), Ways of Nature (1905), and Field and Study (1919).

Burroughs, William S(eward) (b. Jan. 28, 1855, Auburn, N.Y., U.S. — d. Sept. 15, 1898, Citronelle, Ala.) U.S. inventor. He was self-supporting from age 15. In 1885 he constructed his first calculating machine; though it proved commercially impractical, he patented a practical model in 1892. This machine was a commercial success, but he died before he could earn much money from it. A year before his death he received the Franklin Institute's John Scott Medal. In 1905 the Burroughs Adding Machine Co. was organized as successor to the company he had started. William S. Burroughs was his grandson.

Burroughs, William S(eward) (b. Feb. 5, 1914, St. Louis, Mo., U.S. — d. Aug. 2, 1997, Lawrence, Kan.) U.S. novelist. The grandson of the inventor William S. Burroughs, he attended Harvard University and later became a member of the central group of the Beat movement. His experimental novels evoke, in deliberately erratic prose, a nightmarish, sometimes wildly humorous world. His early Junkie (1953) frankly describes his experiences as a heroin addict. The Naked Lunch (1959; film, 1991), his best-known work, is preoccupied with homosexuality and police persecution and vividly satirizes the grotesque world of the addict. (Burroughs accidentally killed his second wife while executing a drunken prank.) In his later novels, including The Soft Machine (1961), Nova Express (1964), The Wild Boys (1971), Cities of the Red Night (1981), and The Western Lands (1987), he further experimented with dystopian visions and radical technical devices.

Bursa formerly Brusa ancient Prusa City (pop., 1997: 1,066,559), northwestern Turkey. It was founded in the 3rd century bc, at the foot of the Mysian Mount Olympus near the southeastern shore of the Sea of Marmara, as the seat of the kings of Bithynia. It flourished under the Romans (see Roman Republic and Empire) and later under the Byzantine Empire. After Crusaders conquered Constantinople (modern Istanbul) in 1204, it was a seat of Byzantine resistance. The Ottoman Empire took it in the early 14th century and made it their first great capital. Conquered by Timur in the early 15th century, it was later recovered by the Ottomans. Though the Ottoman capital was later moved to Constantinople, Bursa continued to prosper. Under the Republic of Turkey, it is a centre for agriculture and is noted for its carpets and many 15th-century mosques.

Burschenschaft Vbur-shon-.shaftV (German: "youth association") German student organization that started as an expression of the nationalism prevalent in post-Napoleonic Europe. First appearing in 1815, the early groups were liberal and egalitarian and favored the political unification of Germany. The groups were suppressed under the Carlsbad Decrees and went underground until 1848, when they participated in the German revolution (see Revolutions of 1 848). After German unification, they adopted a new and aggressive nationalism.

bursitis \bor-'sI-t9s\ Inflammation of the lubricating sac (bursa) over a joint or extension of a joint, or between tendons and muscles or bones, caused by infection, injury, arthritis or gout, calcium deposits along a tendon or joint, or repetitive minor irritation. Common types are "housemaid's knee," "soldier's heel," "tennis elbow," and "weaver's bottom."

Bursitis in the shoulder is the most common form. Usually occurring in people unaccustomed to physical labour, it may be so painful that the affected part cannot be used. Treatment includes rest, heat, mild exercise, and medication to relieve inflammation and remove calcium deposits.

Burt, Sir Cyril (Lodowic) (b. March 3, 1883, Stratford-upon-Avon, Warwickshire, Eng. — d. Oct. 10, 1971, London) British psychologist. He taught at the University of London (1924-50), becoming known for his pioneering work in educational psychology, especially mental testing and statistical analysis. His studies of human intelligence convinced him that intelligence was primarily inherited. Subsequent examination indicated that he had fabricated some of the data, though some of his earlier work remained unaffected by this revelation. His books, which were very popular in England and went through many editions, include The Factors of the Mind (1940), The Backward Child (1961), The Young Delinquent (1965), and The Gifted Child (1975).

Burton, Richard orig. Richard Walter Jenkins, Jr. (b. Nov. 10, 1925, Pontrhydyfen, Wales — d. Aug. 5, 1984, Geneva, Switz.) British-U.S. actor. He first won success on the stage in The Lady's Not for Burning in London (1949) and on Broadway (1950). His first Hollywood film role was in My Cousin Rachel (1952). During the filming of Cleopatra (1963) he had a highly publicized love affair with Elizabeth Taylor, whom he later twice married. Known for his resonant voice and his Welsh mournfulness, he starred again on Broadway in Camelot (1960) and an acclaimed Hamlet (1964). Among his other films are The Spy Who Came in from the Cold (1965), Who's Afraid of Virginia Woolf? (1966), and Equus (1977).

Burton, Robert (1577 -1640) British scholar and writer. He spent most of his life as a vicar at Oxford. His great Anatomy of Melancholy (1621) describes the kinds, causes, symptoms, and cures of melancholy in a lively, elegant, and sometimes humorous style; a mine of classical erudition and curious information, it is an index to the philosophical and psychological ideas of its time. His Latin comedy Philosophaster (1606) is a vivacious exposure of charlatanism.

Burton, Sir Richard (Francis) (b. March 19, 1821, Torquay, Devonshire, Eng. — d. Oct. 20, 1890, Trieste, Austria-Hungary) English scholar-explorer and Orientalist. Expelled from Oxford in 1842, Burton went to India as a subaltern officer. There he disguised himself as a Muslim and wrote detailed reports of merchant bazaars and urban brothels. He then traveled to Arabia, again disguised as a Muslim, and became the first non-Muslim European to penetrate the forbidden holy cities; he recounted his adventures in Pilgrimage to El-Medinah and Mecca (1855-56), a classic account of Muslim life. In 1857-58 he led an expedition with John Hanning Speke in search of the source of the Nile River; stricken with malaria, he turned back after becoming the first European to reach Lake Tanganyika. His travels resulted in a total of 43 accounts of such subjects as Mormons, West African peoples, the Brazilian highlands, Iceland, and Etruscan Bologna. He learned 25 languages and numerous dialects; among his 30 volumes of translations were ancient Eastern manuals on the art of love, and he larded his famous Arabian Nights translation with ethnological footnotes and daring essays that won him many enemies in Victorian society. After his death his wife, Isabel, who was a devout Catholic, burned his 40 years of diaries and journals.

Buru Dutch Boeroe \'bu-ru\ Island, Indonesia. Located west of Ceram in the western Moluccas, it measures 90 mi (145 km) long by 50 mi (81

km) wide. Namlea, the chief town, lies on the narrow coastal plain. It was taken by the Dutch in the mid- 17th century. It became part of Indonesia after World War II. Indonesia used Buru for a prison camp following the 1965 attempted coup; most of the prisoners had been freed by 1981.

Burundi \bu-'run-de\ officially Republic of Burundi Country, east-central Africa. Area: 10,740 sq mi (27,816 sq km). Population (2005 est.): 7,795,000. Capital: Bujumbura. The population is divided primarily between the approximately four-fifths who are Hutu and the approximately one-fifth who are Tutsi. The first inhabitants, the Twa Pygmies, make up about 1% of the population. Languages: Rundi (Kirundi), French (both official), Swahili. Religions: Christianity (mostly Roman Catholic; also Protestant, other Christians); also traditional beliefs. Currency: Burundi franc. Burundi occupies a high plateau straddling the divide of

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BURUND

the Nile and Congo watersheds. The divide runs north to south, rising to about 8,500 ft (2,600 m). The plateau contains the Ruvubu River basin, the southernmost extension of the Nile basin. In the west the

Rusizi River connects Lake Kivu in the north with Lake Tanganyika to the south. Burundi has a developing economy based primarily on agriculture. It is governed by a military regime. It has one legislative house, and its head of state and government is the president assisted by a vice president. Original settlement by the Twa was followed by Hutu settlement, which occurred gradually and was completed by the 11th century. The Tutsi arrived 300-400 years later; though a minority, they established the kingdom of Burundi in the 16th century. In the 19th century the area came within the German sphere of influence, but the Tutsi remained in power. Following World War I, the Belgians took control of the area; their administration was replaced by a UN trusteeship after World War II. Colonial conditions had intensified Hutu-Tutsi ethnic animosities, and, as independence neared, hostilities flared. Independence was granted in 1962 in the form of a kingdom ruled by the Tutsi. In 1965 the Hutu rebelled but were brutally repressed. The two groups clashed violently throughout the rest of the 20th century, although the number of deaths did not approach the nearly one million people killed in Rwanda. The unstable government that existed in these surroundings was overthrown by the military in 1996. In 2001 a transitional government took power, but political instability continued in the region.

| Lake
ft Victoria

CONGO

bus Device on a computer’s motherboard that provides a data path between the CPU and attached devices (keyboard, mouse, disk drives, video cards, etc.). Like a vehicular bus that stops at designated stations to pick up or drop off riders, a computer bus receives a data signal from the CPU and drops it off at the appropriate device (for example, the contents of a file in RAM are sent, via the bus, to a disk drive to be stored permanently). Conversely, data signals from devices are sent back to the CPU. On a network, a bus provides the data path between the various computers and devices. See also USB.

bus Large motor vehicle designed to carry passengers usually along a fixed route according to a schedule. The first gasoline-powered bus was built in Germany in 1895 and carried eight passengers. The first integral-frame bus was constructed in the early 1920s in the U.S. In the 1930s diesel engines were introduced, providing greater power and fuel efficiency to larger buses. With the development of highway systems, transcontinental bus lines became common in North America. Double-decked buses are used in some European cities; articulated buses pull trailers with flexible joints. Trolley buses, whose electric motors draw power from overhead wires, are now used mostly in European cities.

Bush, George (Herbert Walker) (b. June 12, 1924, Milton, Mass., U.S.) 41st president of the U.S. (1989-93). Bush was the son of Prescott Bush, an investment banker and U.S. senator from Connecticut. He served in World War II as a toipedo bomber pilot on aircraft carriers in the Pacific, flying some 58 combat missions; he was shot down by the Japanese in 1944. After graduating from Yale University in 1948, he started an oil business in Texas. He was elected to a Republican seat in the U.S. House of Representatives (1966-70) and later served as ambassador to the UN (1971-72), chief of liaison to China (1974-76), and head of the CIA (1976-77). In 1980 he lost the Republican Party nomination for president to Ronald Reagan. Bush served as vice president under Reagan (198 1—89), whom he succeeded as president, defeating Michael Dukakis. He made no dramatic departures from Reagan’s policies. In 1989 he ordered a brief military invasion of Panama, which toppled that country’s leader, Gen. Manuel Noriega. He helped impose a UN-approved embargo against Iraq in 1990 to force its withdrawal from Kuwait. When Iraq refused, he authorized a U.S. -led air offensive that began the Persian Gulf War. Despite general approval of his foreign policy, an economic recession led to his defeat by Bill Clinton in 1992. His son George W. Bush was elected governor of Texas in 1994 and president of the U.S. in 2000. Another son, Jeb Bush, was elected governor of Florida in 1998.

Bush, George W(alker) (b. July
Governor of Texas (1995-2000) and
43rd president of the U.S. (from
2001). The eldest child of George
Bush, the 41st president of the U.S.

(1989-93), George W. Bush attended
Yale University and Harvard Business School. After spending a decade

in the oil business with mixed success, he served as managing general partner of the Texas Rangers professional baseball franchise. In 1994 he was elected governor of Texas and won reelection by a landslide in 1998. In 2000 Bush captured the Republican Party presidential nomination. Despite losing the national popular vote to Al Gore by more than 500,000 votes, he gained the presidency when the U.S. Supreme Court reversed a recount order by the Florida Supreme Court, enabling him to secure a narrow majority in the electoral college (271-266). In June 2001 Bush signed into law a $1.35 trillion tax-cut bill. In foreign affairs, his administration refused to abide by the Kyoto Protocol on reducing the emission of gases responsible for the greenhouse effect, withdrew from the Treaty on the Limitation of Anti-Ballistic Missile Systems, and attempted to remove U.S. citizens from the jurisdiction of the new International Criminal Court. Following the terrorist attacks on the World Trade Center in New York City and the Pentagon building near Washington, D.C., in September 2001 (see September 1 1 attacks), the Bush administration’s main priorities shifted to domestic security and counterterrorism. Bush identified Osama bin Laden and his al-Qaeda network as responsible for the attacks. In October he launched a military campaign against Afghanistan’s Taliban government, which harboured bin Laden; the invasion of the country routed al-Qaeda and forced the Taliban from power. In late 2002 Bush and British Prime Minister Tony Bair accused the Iraqi government of Saddam Hussein of continuing to possess and develop biological, chemical, and nuclear weapons in violation of UN mandates. After failing to persuade France, Russia, and other UN Security Council members that those weapons would not be uncovered by UN weapons inspections, which had resumed in November, Bush and Blair led an attack on Iraq that toppled Saddam’s regime in 2003. Though no such weapons were found, fighting continued and escalated, as the United States helped Iraq pave the way for democratic elections. Bush faced a strong challenge for the presidency in 2004 by Democratic Senator John Kerry but defeated him in a close contest.

Bush, Vannevar (b. March 11, 1890, Everett, Mass., U.S. — d. June 28, 1974, Belmont, Mass.) U.S. electrical engineer and administrator. He taught principally at MIT (1919-38, 1955-71). In the late 1920s and ’30s, Bush and his students built several electronic analog computers to solve

6, 1946, New Haven, Conn., U.S.)

George W. Bush.

ERIC DRAPER/WHITE HOUSE PHOTO

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differential equations. He helped found Raytheon Co., and he served as president of the Carnegie Institute (1939-55). In 1941 he became director of the U.S. Office of Scientific Research and Development, in which capacity he helped organize the Manhattan Project. By providing government support for university-based scientific research, the agency paved the way for postwar federal support of basic scientific research. As adviser to Pres. Franklin Roosevelt, he laid the groundwork for the establishment of the National Science Foundation (1950). An information retrieval and annotation system he described became the theoretical prototype of hypertext, the basis of the World Wide Web.

bushido \'bu-shi-do\ Japanese "way of the warrior" Code of conduct of the samurai class of Japan, first formulated in the 17th century. Its precise content varied over time, taking on overtones of Zen Buddhism and Confucianism. Along with self-discipline, honour, and austerity, one constant feature was the samurai’s obligation to his lord, which superseded even familial ties. This obligation of loyalty and sacrifice was transferred to the emperor with the Meiji Restoration and was a salient feature of the Japanese national mindset until the end of World War II (1945).

bushmaster Species (Lachesis muta) of pit viper, found in scrublands and forests from Costa Rica south to the Amazon River basin. It is normally about 6 ft (1.8 m) long but reportedly may grow to twice this length. It is pinkish or tan, marked with large, dark, diamond-shaped blotches. Though seldom encountered, the bushmaster is potentially lethal.

Bushmen See San

business cycle Periodic fluctuation in the rate of economic activity, as measured by levels of employment, prices, and production. Economists have long debated why periods of prosperity are eventually followed by economic crises (stock-market crashes, bankruptcies, unemployment, etc.). Some have identified recurring 8-to- 10-year cycles in market economies; longer cycles have also been proposed, notably by Nikolay Kondratev. Apart from random shocks to the economy, such as wars and technological changes, the main influences on the level of economic activity are investment and consumption. An increase in investment, as when a factory is built, leads to consumption because the workers employed to build the factory have wages to spend. Conversely, increases in consumer demand cause new factories to be built to satisfy the demand. Eventually the economy reaches its full capacity, and, with little free capital and no new demand, the process reverses itself and contraction ensues. Natural fluctuations in agricultural markets, psychological factors such as a bandwagon mentality, and changes in the money supply have all been proposed as explanations for initial changes in investment and consumption. After World War II many governments used monetary policy to moderate the business cycle, aiming to prevent the extremes of inflation and depression by stimulating the national economy in slack times and restraining it during expansions. See also productivity.

business finance Raising and managing of funds by business organizations. Such activities are usually the concern of senior managers, who must use financial forecasting to develop a long-term plan for the firm. Shorter-term budgets are then devised to meet the plan's goals. When a company plans to expand, it may rely on cash reserves, expected increases in sales, or bank loans and trade credits extended by suppliers. Managers may also decide to raise long-term capital in the form of either debt (bonds) or equity (stock). The value of the company's stock is a constant concern, and managers must decide whether to reinvest profits or to pay dividends. Other duties of financial managers include managing accounts receivable and fixing the optimum level of inventories. When deciding how to deploy corporate assets to increase growth, financial managers must also consider the benefits of mergers and acquisitions, analyzing economies of scale and the ability of businesses to complement each other. See also corporate finance; inventory.

business law or commercial law or mercantile law Legal rules and principles bearing on business organizations and commercial matters. It regulates various forms of legal business entities, including sole proprietors, partnerships, registered companies with limited liability, agents, and multinational corporations. Nearly all statutory rules governing business organizations are intended to protect creditors or investors. In addition, specific bodies of law regulate commercial transactions, including the sale and carriage of goods (terms and conditions, specific performance, breach of contract, insurance, bills of lading), consumer credit agreements (letters of credit, loans, security, bankruptcy), and relations between employers and employees (wages, conditions of work,

health and safety, fringe benefits, and trade unions). It is a broad and continually evolving field. See also agency; corporation; debtor and creditor;

INTELLECTUAL PROPERTY; LABOUR LAW.

Busoni \bu-'so-ne\, Ferruccio (Dante Michelangiolo Benvenuto) (b. April 1, 1866, Empoli, Tuscany — d. July 27, 1924, Berlin, Ger.) Italian-born German composer and pianist. He first performed in public at age 7, and at 12 he conducted his own Stabat Mater. He taught in Helsinki, Moscow, and Boston before settling permanently in Berlin in 1894. He won fame as a virtuoso pianist and gave premieres of the works of major composers. His most celebrated work in his lifetime, the opera Die Brautwahl (1910), was followed by the operas Arlecchino (1916) and Turandot (1917), but the unfinished and posthumously produced Doktor Faust is regarded as his masterpiece. Of his orchestral works, his piano concerto (1904) is most widely performed. His many piano pieces include the Fantasia contrappuntistica (1910), six sonatinas (1910-20), and arrangements of organ works by Johann Sebastian Bach.

bustard Any of about 23 species of medium-sized to large game birds in the family Otididae, related to the cranes and rails in the order Gruiformes. Bustards are found in Africa, southern Europe, Asia, Australia, and New Guinea. A tall running bird, they have long legs, a compact body carried in a horizontal position, and an erect neck placed forward of the legs. The best-known species is the great bustard (Otis tarda), the largest European land bird. Males of this species weigh as much as 31 lbs (14 kg) and reach lengths of 4 ft (1.2 m), with 8-ft (2.4-m) wingspreads.

Bute, John Stuart, 3rd earl of orig. John Stuart (b. May 25,

1713, Edinburgh, Scot. — d. March 10, 1792, London, Eng.) Scottish-born British statesman. He was the tutor and constant companion of the future George III; when the latter ascended to the throne, he named Bute secretary of state (1761). As prime minister (1762-63), Bute negotiated the peace ending the Seven Years' War, but, having failed to create a stable administration, he resigned in 1763.

Buthelezi N.but-Va-zeV Mangosuthu G(atsha) (b. Aug. 27, 1928, Mahlabatini, Natal, S.Af.) Zulu chief and leader of the Inkatha Freedom Party. Descended from Cetshwayo, he assumed leadership of the Buthelezi clan in 1953. He was elected head of the nonindependent black state of KwaZulu in 1972 and revived Inkatha in 1975 after breaking with the African National Congress (ANC). Rejecting full independence for KwaZulu, he worked within the white establishment to end apartheid. In 1990-94 he engaged in a fierce struggle for leadership with the ANC; thousands were killed in Inkatha- ANC clashes. Following the 1994 national elections, he was appointed minister of home affairs by Nelson Mandela; he held the post until 2004.

Butkus Vbot-kosV, Dick in full Richard J. Butkus (b. Dec. 9, 1942, Chicago, 111., U.S.) U.S. football player. He played for the University of Illinois before joining the Chicago Bears (1965-73). He became known for his aggression and toughness on the field as much as for his play-making ability. His career was shortened by injuries; after retirement he became active in television and sports promotion. Butkus is considered among the best middle linebackers of all time.

Butler, Benjamin F(ranklin) (b. Nov. 5, 1818, Deerfield, N.H., U.S. — d. Jan. 11, 1893, Washington, D.C.) U.S. army officer. A prominent attorney in Lowell, Mass., Butler served two terms in the state legislature (1853, 1859). In the American Civil War he commanded Fort Monroe, Va., where he refused to return fugitive slaves to the Confederacy, calling them “contraband of war,” an interpretation later upheld by the government. He oversaw the occupation of New Orleans in 1862 but was recalled because of his harsh rule. He led the Union army in Virginia, but after several defeats he was relieved of his command in 1865. In the U.S. House of Representatives (1867-75, 1877-79), he was a Radical Republican prominent in the impeachment trial of Pres. Andrew Johnson. He switched parties in 1878 to support the Greenback movement and later served as governor of Massachusetts (1882-84).

Butler, Joseph (b. May 18, 1692, Wantage, Berkshire, Eng. — d. June 16, 1752, Bath, Somerset) British bishop and moral philosopher. He became dean of St. Paul’s Cathedral in 1740 and bishop of Durham in 1750. His works defended revealed religion against the rationalist thinkers of his time. His The Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature (1736) attacked the doctrine of Deism, according to which knowledge of God is acquired through reason rather than revelation. His Of the Nature of Virtue, appended to the Anal-

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Butler ► button I 303

ogy, presented a refutation of hedonism and of the notion that self-interest is the ultimate principle of good conduct.

Butler, Nicholas M(urray) (b. April 2, 1862, Elizabeth, N.J., U.S. — d. Dec. 7, 1947, New York, N.Y.) U.S. educator. He received his Ph.D. from Columbia University. He was the founding president of what is today Columbia's Teachers College (1886-91). As president of Columbia University itself (1901 — 45), he led the institution to world renown. Early in his career he criticized prevailing pedagogical methods, but later he turned on pedagogical reform itself, decrying vocationalism in education and behaviorism in psychology. A champion of international understanding, he helped establish the Carnegie Endowment for International Peace in 1910 and served as its president (1925 — 45). In 1931 he shared the Nobel Peace Prize with Jane Addams.

Butler, R(ichard) A(usten), baron of Saffron Walden (b. Dec. 9, 1902, Attock Serai, India — d. March 8, 1982, Great Yeldham, Essex, Eng.) British politician. Known as "Rab" Butler, he was elected to Parliament in 1929 and served in various Conservative governments in the 1930s. As minister of education, he was responsible for the 1944 Education Act, which established free secondary education. After the Tories' electoral losses in 1945, he helped remold the Conservative Party, serving as its leader (1955-61). He served as chancellor of the exchequer (1951-55), home secretary (1957-62), and foreign secretary (1963-64).

Butler, Samuel (b. Feb. 8, 1612, Strensham, Worcestershire, Eng. — d. Sept. 25, 1680, London) British poet and satirist. He held several clerical positions, where he could observe cranks and scoundrels like those whose antics he targeted. He is famous for Hudibras (1663-78), a mock-heroic poem skewering the fanaticism, pretentiousness, pedantry, and hypocrisy he saw in militant Puritanism. It is the most memorable burlesque poem in English and the first English satire that successfully attacked ideas rather than personalities.

Butler, Samuel (b. Dec. 4, 1835,

Eng. — d. June 18, 1902, London)

British novelist, essayist, and critic.

Descended from distinguished clergymen, he grappled for many years with Christianity and evolution, first embracing, then rejecting, Charles Darwin's theories in his writings. He is best known for The Way of All Flesh (1903), his autobiographical novel that tells, with ruthless wit and lack of sentiment, the story of his escape from the suffocating moral atmosphere of his home circle. In his lifetime his reputation rested on the utopian satire Erewhon (1872), which foreshadowed the end of the Victorian illusion of eternal progress.

Buto Vbyu-to\ In ancient Egyptian religion, the cobra goddess who was tutelary goddess of Lower Egypt and, with the vulture-goddess Nekhbet of Upper Egypt, protector of the king. She was nurse to the infant god Horus and helped his mother, Isis, protect him from his uncle Seth. She was later identified with Leto. She is depicted as a cobra twined around a papyrus stem.

Buton \'bu-,t6n\ or Butung \'bu-,tuq\ Island, east-central Indonesia. Lying off the southeast coast of Celebes (Sulawesi), it is about 100 mi (160 km) long and has an area of about 2,000 sq mi (5,200 sq km). Its chief town is Baubau, on the southwestern coast. The coastal people are chiefly trading sailors and fishermen.

butte \'byiit\ (French: “hillock” or “rising ground”) Flat-topped hill surrounded by a steep cliff, from the bottom of which a slope descends to the plain. The term is sometimes used for an elevation higher than a hill but not high enough to be a mountain. Buttes topped by horizontal platforms of hard rock are characteristic of the arid plateau region of the western U.S. A butte is similar to a mesa but generally smaller; both are created by erosional processes.

butter Solid emulsion of fat globules and water made by churning cream, used as a food. Presumably known since the advent of animal husbandry.

butter has long been used as a cooking fat and as a spread. It was traditionally a farm product, but with the advent of the cream separator in the late 19th century it began to be mass-produced. It is a high-energy food, containing about 715 calories per 100 grams. It is high in butterfat (80-85%) and low in protein. Colouring is sometimes added to enhance its natural yellow colour (from carotene), and salt is often added.

butter-and-eggs or toadflax Common perennial herbaceous plant (Linaria vulgaris) of the snapdragon family, native to Eurasia and widely naturalized in North America. The plant bears flaxlike leaves and showy yellow and orange flowers that are two-lipped and spurred like snapdragons.

buttercup Any of about 250 species of herbaceous flowering plants constituting the genus Ranunculus of the family Ranunculaceae. Buttercups are especially common in the woods and fields of the northern temperate zone. The turban, or Persian buttercup (R . asiaticus), is the florist’s ranunculus. Among the many wild species are the tall meadow buttercup (R . acris) and common water crowfoot (R. aquatilis). Other members of the family Ranunculaceae are widely distributed in all temperate and subtropical regions. In the tropics they occur mostly at high elevations. Their leaves are usually alternate and stalkless and may be

simple or much divided. The flowers may be radially symmetrical or irregular. The family includes such flowers as anemone, larkspur, marsh marigold, clematis, and hepatica (genus Hepatica).

butterfly Any of more than 17,000 lepidopteran species found worldwide. Unlike moths, butterflies are active during the day and are usually brightly coloured or strikingly patterned. Distinctive features are club-tipped antennae and a habit of holding the wings vertically over the back when at rest. With few exceptions the larvae and adults eat plants. Butterflies are classified into five or six families. The metalmarks of the family Lycaenidae are found chiefly in the New World tropics; some members of the family Nymphalidae are called snout butterflies. Other species (with their families) include the white and sulphur butterflies (Pieridae), the swallowtail butterfly (Papilionidae), the blue, copper, and hairstreak butterflies (Lycaenidae), and the admiral, monarch, and painted lady (Nymphalidae).

butterfly bush See buddleia
butterfly effect See chaotic behavior

butterfly weed North American plant (Asclepias tuberosa) of the milkweed family, a stout, rough-haired perennial with long horizontal roots. The leafy, erect, somewhat branching stem is about 1-3 ft (0.3-0.9 m) tall. In midsummer it bears numerous clusters of bright orange flowers. Unlike most milkweeds, it has a scanty milky juice. It is native to dry fields and is often planted in wild gardens or grown as a border plant.

butternut Deciduous NUT-producing tree (Jug Ians cinerea) of the walnut family, native to eastern North America. A mature tree has gray, deeply furrowed bark. Each leaf has 11-17 yellowish green leaflets that are hairy underneath. Chocolate-coloured partitions divide the pith of the twig into many chambers. The egg-shaped fruit has a sticky, greenish brown husk. The hard, woody nut bears many ridges and contains a sweet, oily seed. The tree is economically important for its edible nuts and for a yellow or orange dye obtained from the fruit husks. Some substances in the inner bark of the roots are used in medicines.

button Small disk or knob used as a fastener or ornament. It usually has holes or a shank through which it is sewn to one side of a garment. It is used to fasten or close the garment when it is passed through a loop or hole in the other side. The ancient Greeks fastened their tunics with buttons and loops. In medieval Europe, garments were laced or fastened together with brooches or clasps until the buttonhole was reinvented in the 13th century. Throughout history, buttons have been made in a range of sizes and materials, some elaborated into miniature works of art.

Langar Rectory, Nottinghamshire,

Samuel Butler, detail of an oil painting by Charles Gogin, 1 896; in the National Portrait Gallery, London.

Aquatic buttercup (Ranunculus flabellaris).

FRANCES V. DAVIS

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buttress Exterior support, usually of masonry, projecting from the face of a wall and serving to strengthen it or resist outward thrust from an arch or roof. Buttresses also have a decorative function. Though used since ancient times (Mesopotamian temples featured decorative buttresses, as did Roman and Byzantine structures), they are especially associated with Gothic architecture. See also flying buttress.

Butung See Buton

Buwayhid dynasty See Buyid dynasty

Buxtehude V.buk-sto-'hu-doV Dietrich (b. 1637, probably in Oldesloe, Holstein — d. May 9, 1707, Ltibeck) Danish organist and composer. He held two organist positions before being appointed organist at the important Marienkirche in Ltibeck (now in Germany), where he remained for almost 40 years. There he reinstated the tradition of the Abendmusik, an annual series of church concerts. His reputation was such that in 1705 Johann Sebastian Bach traveled 200 miles there to hear him play and ended up staying three months. Buxtehude's approximately 130 surviving vocal works, usually called cantatas, can instead be classified as concertos, chorale settings, and arias. All are imbued with a devout simplicity that contrasts strongly with the elaborations of their Bachian successors. He also composed almost 100 works for organ, some 20 keyboard suites, and more than 20 chamber sonatas.

Buyid \'bu-yid\ dynasty or Buwayhid \bii-'wl-hid\ dynasty (945-1055) Muslim ShTite dynasty founded by three sons of Buyeh, a Daylamite (north Persian) fisherman. They captured Baghdad in 945, and each brother took a portion of territory. After they died, one Buyid leader, c Adud al-Dawlah, consolidated control (977) and enlarged the Buyid domain. From 983 the territories were split among family members. The dynasty ended when the Turkic Seuuq dynasty took Baghdad in 1055. Buyid art maintained its influence throughout the Seljuq reign; Buyid silverwork is notable.

buzkashi Persian "goat dragging" An equestrian game in which riders compete to gain control of a goat or calf carcass that has been decapitated and dehoofed. Buzkashi likely originated as an entertaining variant of ordinary herding or raiding. It is popular predominantly among Turkic peoples in Afghanistan but can be found in the Muslim republics of Central Asia and in parts of northwestern China. Buzkashi has two main forms. The traditional version, tudabaray, has no formal teams and is not

played within clearly defined boundaries. Games often involve hundreds of riders, and the objective is to gain sole possession of the carcass and ride it free and clear of all other riders. The modern government-sponsored qarajay style involves two teams of 10-12 riders that contend on a defined field with goals. Beginning in the early 1950s, the Kabul-based Afghan government hosted national tournaments.

buzz bomb See V-l missile

buzzard Chiefly British term for any of several birds of prey of the hawk genus Buteo (family Accipitridae) and, in North America, various New World vultures, especially the turkey vulture. In Australia, a large hawk of the genus Hamirostra is called a black-breasted buzzard. The buteos, also called buzzard hawks, can usually be distinguished when soaring by their broad wings and expansive rounded tail. The plumage of most species is dark brown above and white or mottled brown below; the tail and underside of the wings are usually barred. Buteos customarily prey on insects, small mammals, and occasionally birds. They nest in trees or on cliffs. Species range over much of the New World, Eurasia, and Africa. The red-tailed hawk, the most common North American buteo, is about 2 ft (60 cm) long.

Buzzards Bay Inlet of the Atlantic Ocean, southeastern Massachusetts, U.S. Connected to Cape Cod Bay by the Cape Cod Canal on the northeast and bordered on the southeast by the Elizabeth Islands, it is 30 mi (48 km) long and 5-10 mi (8-16 km) wide. Its coastline is dotted with fishing villages and summer resorts. Buzzards Bay town (pop., 2000: 3,549) is the site of Massachusetts Maritime Academy.

Byatt, A(ntonia) S(usan) orig. Antonia Susan Drabble (b.

Aug. 24, 1936, Sheffield, Eng.) British novelist and scholar. Sister of Margaret Drabble, she was educated at Cambridge and taught at University College, London. Her third novel, The Virgin in the Garden (1978), won high acclaim; the sequel Still Life (1985) followed. Possession (1990), a virtuoso double narrative, won the 1990 Booker Prize, and both it and Angels and Insects (1991) were adapted for film. Her story collec-

tions include The Djinn in the Nightingale’ s Eye (1995) and Elementals (1998). Degrees of Freedom (1965) was the first major study of Iris Murdoch. In 2002 Byatt published the novel A Whistling Woman, the last of a series of four novels — beginning with The Virgin in the Garden — featuring the character Frederica Potter.

Byblos Vbi-bl3s\ modern Jbail or Jubayl \ju-‘bal\ Ancient coastal city, eastern Mediterranean Sea. Located north of Beirut, Leb., the site was occupied by at least the Neolithic Period (New Stone Age); extensive settlement developed during the 4th millennium bc. As the chief harbour for the export of cedar to Egypt, it was a great trading centre. Papyrus, an early writing surface produced in Egypt, received its original Greek name, byblos, from its export to the Aegean through the city; the English word Bible means essentially “the (papyrus) book.” Almost all known early Phoenician inscriptions, most from the 10th century bc, come from Byblos. By that time Tyre had become the preeminent city in Phoenicia, and, though Byblos continued to flourish into Roman times, it never recovered its former supremacy.

Bydgoszcz \'bid-,g6shch\ City (pop., 2000 est.: 384,500), northern Poland. Originally a commercial city of the Teutonic Order, it received town rights in 1346. It prospered as a grain and timber centre until it was devastated in the 17th-century Swedish wars. In the 18th century the Bydgoszcz Canal, which linked the basins of the Vistula and Oder rivers, made the city a major inland port. It fell under Prussian rule in 1772-1919. The Germans held it throughout World War II, but it was noted for its staunch resistance to the Nazi invasion of 1939. It remains important as a water transport route, connecting Upper Silesia with the Baltic ports.

Byelarus See Belarus

Byelorussian language See Belarusian language
bypass surgery See coronary bypass

Byrd, Richard E(velyn) (b. Oct. 25, 1888, Winchester, Va., U.S. — d. March 11, 1957, Boston, Mass.) U.S. naval officer, aviator, and polar explorer. After serving in World War I, he worked developing navigational aids for aircraft. In 1926 he and Floyd Bennett claimed to have reached the North Pole by airplane, becoming the first to do so. In 1928 Byrd began his explorations of Antarctica with the first expedition to his “Little America” base, which was followed in 1929 by a flight with three companions over the South Pole, again the first such flight. He led subsequent expeditions that discovered and mapped large areas of Antarctica. His several books include Discovery (1935) and Alone (1938), which chronicled his months spent alone in a camp near the South Pole. His brother Harry F. Byrd (1887-1966) served as a U.S. senator from Virginia (1933-65).

Byrd, William (b. 1543, Lincoln, Lincolnshire?, Eng. — d. July 4, 1623, Stondon Massey, Essex) British composer. He studied under Thomas Tallis and was appointed organist of Lincoln Cathedral at age 20. In 1572 he became organist of the Chapel Royal, sharing the post with Tallis. In 1575 the two men received from Elizabeth I the exclusive license for the printing and selling of music in Britain. Though repeatedly prosecuted as a Roman Catholic, Byrd remained in favour with the queen. He is renowned as Britain’s finest composer of sacred choral works, as well as for his keyboard music and songs. His works include three masses (for three, four, and five voices), some 220 Latin motets, four important Anglican services, and some 60 anthems, as well as some 100 virginal pieces (many preserved in the collections Parthenia and The Fitzwilliam Virginal Book).

Byrne, David (b. May 14, 1952, Dumbarton, Dunbartonshire, Scot.) Scottish-born U.S. singer and songwriter. At the Rhode Island School of Design in the mid-1970s, he cofounded the rock group Talking Heads as singer and guitarist. Identified with the new wave movement (see punk), the band’s debut album Talking Heads ’77 (1977) was followed by releases that reflected Byrne’s interest in experimental pop and African rhythms, including Speaking in Tongues (1983), Stop Making Sense (soundtrack for film of the same name; 1984), and solo albums such as Rei Momo (1989). An ethnomusicologist and producer, Byrne also wrote the score for choreographer Twyla Tharp’s The Catherine Wheel (1980) and directed the film True Stories (1986).

Byron, George (Gordon) Byron, 6th Baron known as Lord Byron (b. Jan. 22, 1788, London, Eng.— -d. April 19, 1824, Missolonghi, Greece) British Romantic poet and satirist. Born with a clubfoot and extremely sensitive about it, he was 10 when he unexpectedly inherited

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his title and estates. Educated at Cambridge, he gained recognition with English Bards and Scotch Reviewers (1809), a satire responding to a critical review of his first published volume, Hours of Idleness (1807). Childe Harold's Pilgrimage (1812-18), a poetic travelogue expressing melancholy and disillusionment, brought him fame, while his complex personality, dashing good looks, and many scandalous love affairs, with women and with boys, captured the imagination of Europe. Settling near Geneva, he wrote the verse tale The Prisoner of Chillon (1816), a hymn to liberty and an indictment of tyranny, and Manfred (1817), a poetic drama whose hero reflected Byron's own guilt and frustration. His greatest poem, Don Juan (1819-24), is an unfinished epic picaresque satire in ottava rima. Among his numerous other works are verse tales and poetic dramas. He died of fever in Greece while aiding the struggle for independence, making him a Greek national hero.

byssinosis \,bi-s3-'no-s3s\ or brown lung disease Respiratory disorder caused by dust from cotton and other fibres, common among textile workers. In addition, the dust stimulates histamine release; air passages constrict, making breathing difficult. Over time the dust accumulates in the lung, producing a typical brown discoloration. Byssinosis today is seen in most cotton-producing regions of the world. Several years of exposure to cotton dust are needed before byssinosis develops. In advanced stages, it causes chronic, irreversible obstructive lung disease. Though cotton is by far the most common cause, flax, hemp, and other organic fibres can also produce byssinosis. There is evidence that a bacterial product found in the fibres is the cause of the disease.

byte See bit

Byzantine architecture Vbi-zon-.tenV Building style of Constantinople (now Istanbul, formerly ancient Byzantium) after ad 330. Byzantine architects were eclectic, at first drawing heavily on Roman temple features. Their combination of the basilica and symmetrical central-plan (circular or polygonal) religious structures resulted in the characteristic Byzantine Greek-cross-plan church, with a square central mass and four arms of equal length. The most distinctive feature was the domed roof. To allow a dome to rest above a square base, either of two devices was used: the squinch (an arch in each of the comers of a square base that transforms it into an octagon) or the pendentive. Byzantine structures featured soaring spaces and sumptuous decoration: marble columns and inlay, mosaics on the vaults, inlaid-stone pavements, and sometimes gold coffered ceilings. The architecture of Constantinople extended throughout the Christian East and in some places, notably Russia, remained in use after the fall of Constantinople (1453). See also Hagia Sophia.

Byzantine art Art associated with the Byzantine Empire. Its characteristic styles were first codified in the 6th century and persisted with remarkable homogeneity until the capture of Constantinople by the Turks in

1453. Concerned almost exclusively with religious expression, it tends to reflect an intensely hierarchical view of the universe. It relies on vigour of line and brilliance of colour; individual features are absent, forms are flattened, and perspective is absent. Walls, vaults, and domes were covered in mosaic and fresco decoration in a total fusion of architectural and pictorial expression. Byzantine sculpture was largely limited to small ivory reliefs. The importance of Byzantine art to European religious art was immense; the style was spread by trade and expansion to the Mediterranean basin, eastern European centres, and especially Russia. See also Byzantine architecture.

Byzantine chant Unison liturgical chant of the Greek Orthodox church from the era of the Byzantine Empire to the 16th century. It probably derived principally from Hebrew and Syrian Christian liturgies. A system of eight modes, very similar to the eight Greek modes, was used for psalms and hymns, each mode (or echos) consisting primarily of a few melodic formulas. The principal hymn genres were the troparion (one or more stanzas of poetic prose), the kontakion (a metrical sermon), and the kanon (a complexly ordered set of hymn types). See also Gregorian chant.

Byzantine Empire Empire, southeastern and southern Europe and western Asia. It began as the city of Byzantium, which had grown from an ancient Greek colony founded on the European side of the Bosporus. The city was taken in ad 330 by Constantine I, who refounded it as Constantinople. The area at this time was generally termed the Eastern Roman Empire. The fall of Rome in 476 ended the western half of the Roman Empire; the eastern half continued as the Byzantine Empire, with Constantinople as its capital. The eastern realm differed from the west in many respects: heir to the civilization of the Hellenistic era, it was more com-

Byzantine Emperors

Zeno

474-491

Theodora (empress)

1055-56

Anastasius 1

491-518

Michael VI Stratioticus

1056-57

Justin 1

518-527

Isaac 1 Comnenus

1057-59

Justinian 1

527-565

Constantine X Ducas

1059-67

Justin II

565-578

Romanus IV Diogenes

1067-71

Tiberius II Constantine

578-582

Michael VII Ducas

1071-78

Maurice Tiberius

582-602

Nicephorus III Botaniates

1078-81

Phocas

602-610

Alexius 1 Comnenus

1081-1118

Heraclius

610-641

John II Comnenus

1 1 1 8-43

Heraclius Constantine

641

Manuel 1 Comnenus

1143-80

Heraclonas (or Heraclius)

641

Alexius II Comnenus

1180-83

Constans II (Constantine

641-668

Andronicus 1 Comnenus

1183-85

Pogonatus)

Isaac II Angelus

1 1 85-95

Constantine IV

668-685

Alexius III Angelus

1 1 95-1 203

Justinian II Rhinotmetus

685-695

Isaac II Angelus (restored]

1 203-4

Leontius

695-698

& Alexius IV Angelus

Tiberius III

698-705

Alexius V Ducas

1204

Justinian II Rhinotmetus

705-71 1

Murtzuphlus

(restored)

Latin emperors

Philippicus

711-713

Baldwin 1

1204-5

Anastasius II

713-715

Henry

1206-16

Theodosius III

715-717

Peter

1217

Leo III

717-741

Yolande (empress)

1217-19

Constantine V

741-775

Robert

1221-28

Copronymus

Baldwin II

1228-61

Leo IV

775-780

John

1231-37

Constantine VI

780-797

Nicaean emperors

Irene (empress)

797-802

Constantine (XI)

1204-5?

Nicephorus 1

802-811

Theodore 1 Lascaris

1 205?-22

Stauracius

811

John III Ducas Vatatzes

1 222-54

Michael 1 Rhangabe

811-813

Theodore II Lascaris

1254-58

Leo V

813-820

John IV Lascaris

1258-61

Michael II Balbus

820-829

Greek emperors restored

Theophilus

829-842

Michael VIII

1261-82

Michael III

842-867

Palaeologus

Basil 1

867-886

Andronicus II

1 282-1 328

Leo VI

886-912

Palaeologus

Alexander

912-913

Andronicus III

1328-41

Constantine VII

913-959

Palaeologus

Porphyrogenitus

John V Palaeologus

1341-76

Romanus 1 Lecapenus

920-944

John VI Cantacuzenus

1347-54

Romanus II

959-963

Andronicus IV

1376-79

Nicephorus II Phocas

963-969

Palaeologus

John 1 Tzimisces

969-976

John V Palaeologus

1 379-90

Basil II Bulgaroctonus

976-1025

(restored)

Constantine VIII

1025-28

John VII Palaeologus

1390

Romanus III Argyrus

1028-34

John V Palaeologus

1 390-91

Michael IV

1034-41

(restored)

Michael V Calaphates

1041-42

Manuel II Palaeologus

1391-1425

Zoe (empress)

1042-50

John VIII Palaeologus

1421-48

Constantine IX

1042-55

Constantine XI

1449-53

Monomachus

Palaeologus

*For emperors of the Eastern Roman Empire (at Constantinople) before the fall of Rome, see Roman republic and empire.

mercial and more urban. Its greatest emperor, Justinian (r. 527-565), reconquered some of western Europe, built the Hagia Sophia, and issued the basic codification of Roman law. After his death the empire weakened. Though its rulers continued to style themselves “Roman” long after Justinian’s death, “Byzantine” more accurately describes the medieval empire. The long controversy over iconoclasm within the eastern church prepared it for the break with the Roman church (see Schism of 1 054). During the controversy, Arabs and Seljuq Turks increased their power in the area. In the late 11th century, Alexius I Comnenus sought help from Venice and the pope; these allies turned the ensuing Crusades into plundering expeditions. In the Fourth Crusade the Venetians took over Constantinople and established a line of Latin emperors. Recaptured by Byzantine exiles in 1261, the empire was now little more than a large city-state. In the 14th century the Ottoman Turks began to encroach; their extended siege of Constantinople ended in 1453, when the last emperor died fighting on the city walls and the area came under Ottoman control.

Byzantium See Istanbul

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C High-level procedural computer programming language with many low-level features, including the ability to handle memory addresses and bits. It is highly portable among platforms and therefore widely used in industry and among computer professionals. C was developed by Dennis M. Ritchie (bom 1941) of Bell Laboratories in 1972. The operating system UNIX was written almost exclusively in C, and C has been standardized as part of POSIX (Portable Operating System Interface for UNIX).

C++ \'se- , pl9s- , pbs\ High-level computer programming language. Developed by Bjarne Stroustrup of Bell Laboratories in the early 1980s, it is traditional C language with added object-oriented programming capabilities. C++, along with Java, has become popular for developing commercial software packages that incorporate multiple interrelated applications.

C-section See cesarean section
Cabala See Kabbala

Caballero, Francisco

Largo Caballero

Largo See Francisco

cabaret \,ka-b3-'ra\ Restaurant that serves liquor and offers light musical entertainment. The cabaret probably originated in France in the 1880s as a small club that presented amateur acts and satiric skits lampooning bourgeois conventions. The first German Kabarett was opened in Berlin c. 1900 by Baron Ernst von Wolzogen and accompanied its musical acts with biting political satire. By the 1920s it had become the centre for underground political and literary expression and a showcase for the works of social critics such as Be tolt Brecht and Kurt Weill; this decadent but fertile artistic milieu was later portrayed in the musical Cabaret (1966; film, 1972). The English cabaret derived from concerts given in city taverns in the 1 8th—19th centuries and evolved into the music hall. In the U.S. the cabaret developed into the nightclub, where comedians, singers, or musicians performed. Small jazz and folk clubs and, later, comedy clubs evolved from the original cabaret.

cabbage Leafy garden plant (Brassica oleracea, Capitata group) of European origin, with a short stem and a globular head of usually green leaves. A member of the mustard family, it is a major table vegetable in most countries of the temperate zone. The term cabbage also refers more generally to a vegetable and fodder plant of various horticultural forms developed by long cultivation from the wild, or sea, cabbage (B . oleracea) found near the seacoast in England and continental Europe. The common forms may be classified by the plant parts used for food: leaves (e.g., KALE, collard, common cabbage, Brussels sprout); flowers and flower stalks (e.g., broccoli, cauliflower); and stems (e.g., kohlrabi). Cabbages grow best in mild to cool climates and tolerate frost. Edible portions are low in caloric value and are an excellent source of vitamin C, minerals, and dietary fibre.

See also Chinese cabbage.

cabbage looper Distinctive green, white-lined larva, or caterpillar {Trichoplusia ni), of the owlet MOTH family (Noctuidae). Like other loopers, it moves in an “inching” motion. It is an economic pest of cabbages and associated crops, particularly in the U.S. and Europe. The adults, known as Ni moths, migrate considerable distances. They are mottled brown with a pale Y-shaped mark on each forewing. The typical adult wingspan is about 1 in. (25 mm).

cabbage palmetto See palmetto

cabbage white or cabbage butterfly European cabbage butterfly (Pieris rapae). Its larva is a major economic pest, attacking cabbage and related plants. Introduced into North America c. 1860, the cabbage white is today one of the most common North American white butterfly species.

Cabbala See Kabbala

Cabeiri or Cabiri \ko-'bI- l ri\ Important group of deities, probably of Phrygian origin, worshiped in Asia Minor and in Macedonia and northern and central Greece. In classical times there were two males, Axiocersus and his son Cadmilus, and two females, Axierus and Axiocersa. They were promoters of fertility and protectors of seafarers. The male pair, the more important, was often confused with the Dioscuri. The Cabeiri were also identified with the Great Gods of Samothrace, and their cult reached its height in the 4th century bc.

Cabell Vkab-olV, James Branch (b. April 14, 1879, Richmond, Va., U.S. — d. May 5, 1958, Richmond) U.S. writer. Cabell attacked American orthodoxies and institutions in his best-known novel, Jurgen (1919), a story replete with sexual symbolism. His other works, many of them allegories set in an imaginary medieval province, include The Cream of the Jest (1917) and The High Place (1923). Though much praised in the 1920s, his mannered style and skeptical view of human experience soon lost favour.

Cabeza de Vaca Vko-'ba-zo-do-'va-koV Alvar Nunez (b. c. 1490, Extremadura, Castile — d. c. 1560, Sevilla, Spain) Spanish explorer. He took part in an expedition that reached what is now Tampa Bay, Fla., U.S., in 1528. One of only four members of the expedition to survive, he spent eight years in the Gulf region of modern Texas. His accounts of the legendary Seven Cities of Cibola probably inspired the extensive explorations of North America by Hernando de Soto and Francisco Vazquez de Coronado.

Cabezon V.ka-ba-'thonV Antonio de (b. c. 1510, Castrillo de Matajudios, near Burgos, Spain — d. March 26, 1566, Madrid) Spanish composer and organist. Of noble birth, he was blind from early childhood. In 1526 he became organist to Isabella, wife of Charles V. He remained a royal favourite, especially to Philip II, whom he accompanied on his travels. His works, which influenced the English virginalists and J.P. Sweelinck, are almost entirely for

keyboard; they include numerous tientos (ricercars or fantasias) and diferencias (variations), a genre of which he was one of the first masters.

cabildo Spanish "municipal council" Fundamental unit of local government in colonial Latin America. It was responsible for all ordinary aspects of municipal government, including policing, sanitation, taxation, price and wage regulation, and the administration of justice. Its jurisdiction extended beyond the city to the surrounding hamlets and countryside. By the mid- 16th century appointments to cabildos were usually made by the Spanish crown and could be sold or inherited. Cabildos were often corrupt, but cabildos abiertos (open town meetings) were important to the Latin American independence movement of the early 19th century.

cabinet Body of senior ministers or, in the U.S., advisers to a chief executive, whose members also serve as the heads of government departments. The cabinet has become an integral part of parliamentary government in many countries, though its form varies. It developed from the British Privy Council, when King Charles II and Queen Anne regularly consulted the council's leading members to reach decisions before meeting with the unwieldy full council. The modern British cabinet consists of departmental ministers, drawn from the members of Parliament and appointed by the prime minister. In the U.S., the cabinet serves as an advisory group to the president without the sanction of law. Members' appointments are subject to Senate approval, and the U.S. Constitution sets cabinet members' order of succession to the presidency. The cabinet includes the secretaries of State, Treasury, Defense, Interior, Agriculture, Commerce, Labor, Health and Human Services, Housing and Urban Development, Transportation, Education, Energy, and Veterans Affairs and the attorney general.

cable car See streetcar

cable modem Modem used to convert analog data signals to digital form and vise versa, for transmission or receipt over cable television lines, especially for connecting to the Internet. A cable modem modulates and demodulates signals like a telephone modem, but is a much more complex device. Data can be transferred over cable lines much more quickly than over traditional phone lines. Transmission rates are typically around 1.5 megabits per second. Faster transmission is actually possible, but speed is usually restricted by the cable company's (typically slower) connection to the Internet. Cable Internet access is regarded as a replacement for slower dial-up and ISDN services, and is competitive with other broadband modes of delivery (e.g., DSL connections). See also broadband technology.

Cable News Network See CNN

cable structure Form of long-span structure that is subject to tension and uses suspension cables for support. Highly efficient, cable structures

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include the suspension bridge, the cable-stayed roof, and the bicycle-wheel roof. The graceful curve of the huge main cables of a suspension bridge is almost a catenary, the shape assumed by any string or cable suspended freely between two points. The cable-stayed roof is supported from above by steel cables radiating downward from masts that rise above roof level. The bicycle- wheel roof involves two layers of tension cables radiating from an inner tension ring and an outer compression ring, which in turn is supported by columns.

cable television System that distributes television signals by means of coaxial or fibre-optic cables. Cable television systems originated in the U.S. in the early 1950s to improve reception in remote and hilly areas, where broadcast signals were weak. In the 1960s they were introduced in large metropolitan areas where reception is sometimes degraded by reflection of signals from tall buildings. Since the mid-1970s there has been a proliferation of cable systems that offer special services and which generally charge a monthly fee. Besides providing high-quality signals, some systems can deliver hundreds of channels. Another feature increasingly offered by cable operators is two-way, interactive communication by which viewers can, for example, participate in public-opinion polls as well as connect to the Internet. Cable operators are also involved in the development of video compression, digital transmission, and high-definition television.

Cabot/ George (b. Jan. 16, 1752, Salem, Mass. — d. April 18, 1823, Boston, Mass., U.S.) U.S. Federalist Party leader. After studying at Harvard University, he went to sea; he became a shipowner and successful merchant, retiring from business in 1794. Elected to the U.S. Senate (1791-96), he supported the fiscal policies of Alexander Hamilton. In 1793 he was appointed a director of the Bank of the United States. A member of the Federalist Essex Junto, he presided at the Hartford Convention in 1814.

Cabot, John orig. Giovanni Caboto (b. c. 1450, Genoa? — d. c. 1499) Italian navigator and explorer. In the 1470s he became a skilled navigator in travels to the eastern Mediterranean for a Venetian mercantile firm. In the 1490s he moved to Bristol, Eng., and, with support from city merchants, he led an expedition in 1497 to find trade routes to Asia. After landing somewhere in North America, possibly southern Labrador or Cape Breton Island, he took possession of the land for Henry VII and conducted explorations along the coastline. On a second expedition in 1498, he may have reached America but probably was lost at sea. His two voyages for England helped lay the groundwork for the later British claim to Canada. Sebastian Cabot was his son.

Cabot, Sebastian (b. c. 1476, Bristol, Gloucestershire, Eng., or Venice — d. 1557, London) English navigator, explorer, and cartographer. The son of John Cabot, he served at various times both the English and Spanish crowns. In 1525 he took charge of a Spanish expedition, abandoning the original goal of developing trade with the Orient and instead embarking on a fruitless expedition to South America. Later he served in England as governor of the Merchant Adventurers, organizing an expedition to search for a northeast passage from Europe to the Orient.

Cabral \k9-'bral\, Amilcar (b. 1921, Bafata, Portuguese Guinea — d. Jan. 20, 1973, Conakry, Guinea) Guinean nationalist politician. In 1956 he founded the Partido Africano da Independence da Guine e Cabo Verde,

which in 1962 began a war of liberation against Portuguese forces. By the late 1960s Cabral controlled much of Portuguese Guinea. He was assassinated in 1973. His half-brother, Luis de Almeida Cabral, became the first president of independent Guinea-Bissau in 1974.

Cabral, Pedro Alvares (b. 1467/68, Belmonte, Port. — d. 1520, Santarem?) Portuguese navigator credited with the discovery of Brazil. A nobleman, Cabral long enjoyed the favour of Manuel I of Portugal, who in 1500 sent him and 13 ships on the second Portuguese voyage to India, following the route taken by Vasco da Gama, to strengthen commercial ties and further Portugal’s conquests. Cabral sailed southwest on a route that took him close to lands that had previously been sighted and claimed by the Portuguese. On April 22, 1500, he landed on the coast of what is now Brazil and formally took possession of the country for Portugal. The rest of his journey to India and back was beset by misfortune; only four ships returned to Portugal.

Cabrillo \k3-'bri-lo\, Juan Rodriguez (d. Jan. 3, 1543?, off the coast of northern California) Explorer in the service of Spain and discoverer of California. Little is known of his early life, though he may have been born in Portugal. In 1520 he accompanied Spanish explorers to Mexico.

He was one of the conquerors of present-day Guatemala, where he may have served as governor. In 1542 he left Mexico and sailed along the California coast, entering San Diego and Monterey bays. He landed on several islands off the coast; he apparently died of complications from a broken leg suffered on one such landing.

Cabrini, Saint Frances Xavier known as Mother Cabrini (b.

July 15, 1850, Sant’ Angelo Lodigiano, Lombardy, Austria — d. Dec. 22, 1917, Chicago, 111., U.S.; canonized July 7, 1946; feast day December 22) Italian-born U.S. missionary, the first U.S. citizen to be canonized by the Roman Catholic church. She was determined from childhood to become a missionary, and she took her vows in 1877. She founded the Missionary Sisters of the Sacred Heart in 1880, and in 1889 Pope Leo XIII sent her to the U.S. to work among Italian immigrants. She lived in New York City and Chicago but traveled in the Americas and Europe to found 67 houses of her order.

cacao \ko-'kau\ Tropical New World tree (Theobroma cacao) of the chocolate family (Sterculiaceae, or Byttneriaceae). Its seeds, after fermentation and roasting, yield cocoa and chocolate. Cocoa butter is extracted from the seed. The tree is grown throughout the wet lowland tropics, often in the shade of taller trees. Its thick trunk supports a canopy of large, leathery, oblong leaves. The small, foul-smelling, pinkish flowers are borne directly on the branches and trunk; they are followed by the fruit, or pods, each yielding 20^10 seeds, or cocoa beans.

Caccini \kat-'che-ne\, Giulio or Giulio Romano (b. c. 1550, Rome, Papal States — buried Dec. 10, 1618, Florence) Italian composer and singer. He accompanied his patron, Cosimo I, to Florence in the 1570s; there he became associated with the Camerata, an academy that dedicated much attention to producing a revival of ancient Greek drama. His Euridice (1600), embodying the Camerata’ s ideals, was the first opera to be published and was one of the first two surviving operas; the other, also

titled Euridice, is largely by Jacopo Peri (1561-1633), whose lost Dafne (1598) was the first opera of all. Caccini’s Le nuove musiche (1602), a collection of songs with basso continuo, was of landmark importance in establishing the new monodic style.

cachalot See sperm whale

cache \'kash\ Temporary computer storage used for quick retrieval of data in order to increase processing speed. The cached data can be stored in a reserved area of RAM, a special cache chip (separate from the CPU) that provides faster access than RAM, or on the disk drive. By keeping frequently accessed data in a rapidly accessible place, the computer can respond quickly to requests for those data without having to perform time-consuming searches of RAM or hard drives. Since a “stale” cache will contain data that have been superseded by later information, the cached data must be refreshed periodically.

cachet, lettre de See lettre de cachet

cactus Any of the flowering plants that make up the family Cactaceae, containing about 1,650 species, native through most of North and South America, with the greatest number and variety in Mexico. Cacti are succulent perennials. Most live in and are well adapted to dry regions. Cacti generally have thick herbaceous or woody stems containing chlorophyll. Leaves usually are absent or greatly reduced, minimizing the surface area from which water can be lost; the stem is the site of photosynthesis. The generally thin, fibrous, shallow root systems range widely in area to absorb superficial moisture. Cacti vary greatly in size and appearance, from buttonlike peyote and low clumps of prickly pear and hedgehog cactus (Echinocereus) to the upright columns of barrel cacti (Ferocactus and Echinocactus) and the imposing saguaro. Cacti can be distinguished from other succulent

Golden rainbow cactus (Echinocereus dasyacanthus) , a hedgehog cactus, growing in the desert of southwestern Texas.

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plants by the presence of small cushionlike structures (areoles) from which, in almost all species, spines arise, as do flowers, branches, and leaves (when present). Flowers, often large and colourful, are usually solitary. Cacti are widely cultivated as ornamentals. Various species, notably prickly pears and chollas, are cultivated as food. Barrel cacti are an emergency source of water for people.

Cacus and Caca \'ka-k9s...'ka-k9\ In Roman religion, brother and sister fire deities of the early Roman settlement on the Palatine Hill. Virgil described Cacus as the son of Vulcan and as a fire-breathing brigand who terrorized the countryside. He stole some of the giant Geryon’s cattle from Hercules (see Heracles) and hid them in his lair, but Hercules discovered Cacus’ s hiding place and killed him. The story is traditionally connected with the establishment of Hercules’s oldest Roman place of worship, the Ara Maxima, in the Forum Boarium (cattle market).

CAD/CAMVkad-.kam, ,kad-'kam\ in full computer-aided design/computer-aided manufacturing. Integration of design and manufacturing into a system under direct control of digital computers. CAD systems use a computer with terminals featuring video monitors and interactive graphics-input devices to design such things as machine parts, patterns for clothing, or integrated circuits. CAM systems use numerically controlled (see numerical control) machine tools and high-performance programmable industrial robots. Drawings developed during the design process are converted directly into instructions for the production machines, thus optimizing consistency between design and finished product, and providing flexibility in altering machine operations. These two processes are sometimes grouped as CAE (computer-aided engineering).

Cadbury, George (b. Sept. 19, 1839, Birmingham, Warwickshire, Eng. — d. Oct. 24, 1922, Birmingham) British businessman and social reformer. In 1861 he and his brother Richard took over their father’s failing business and built it into the highly prosperous Cadbury Brothers cocoa- and chocolate-manufacturing firm. They improved working conditions and introduced a private social security program for employees. George was also noted for his successful experiments in housing and town planning in Bourn ville, where he built affordable working-class homes with large gardens.

caddis fly Any member of about 7,000 species of mothlike aquatic insects (order Trichoptera) found worldwide, usually in freshwater habitats but sometimes in brackish and tidal waters. Generally dull brownish, caddis flies have long antennae and hairy wings that fold rooflike over the abdomen. They feed primarily on plant juices and flower nectar, though a few are predaceous. Many caddis-fly larvae construct a portable case from grains of sand, bits of shells, and plant debris glued together by a sticky substance they secrete. This case surrounds the larva’s abdomen while it matures. Caddis flies are important to freshwater ecosystems because they clean the water by consuming plant and animal debris and serve, as larvae and adults, as an important food for fish, particularly trout.

Caddo One of a group of North American Indian people living mostly in western Oklahoma, U.S. Their language is of the Caddoan language family. Their name derives from a French truncation of kadohadacho, meaning “real chief’ in Caddo. From ancient times they occupied the lower Red River area in Louisiana and Arkansas, and many striking examples of prehistoric pottery and basketry have been found. They were a semisedentary agricultural people who lived in conical pole-and-thatch dwellings. In the 18th century pressures from white settlers pushed many Caddo off their lands, a process that intensified with the Louisiana Purchase in 1803. By 1835 the Caddo had ceded all their land to the U.S., and by 1859 most were living on reservations in Oklahoma. Some 2,700 Caddo claimed sole Caddo descent in the 2000 U.S. census.

Cade's Rebellion (1450) Uprising against the government of Henry VI of England. Jack Cade, an Irishman of uncertain occupation living in Kent, organized a rebellion among local small property holders angered by high taxes and prices. He took the name John Mortimer, identifying himself with the family of Henry’s rival, the duke of York. Cade and his followers defeated a royal army in Kent and entered London, where they executed the lord treasurer. They were soon driven out of the city; Cade’s followers dispersed on being offered a pardon, and Cade was mortally wounded in Sussex. His rebellion contributed to the breakdown of royal authority that led to the Wars of the Roses.

Cadiz \ko-'diz,\ Spanish \'ka-thes\ City (pop., 2001: city, 133,363; metro, area, 400,157), southwestern Spain. Located on a peninsula in the Bay of Cadiz northwest of Gibraltar, it is the main seaport of Cadiz province in Andalusia. Founded as Gadir by Phoenicians from Tyre c. 1100 bc, it was later ruled by Carthage, Rome (as Gades), and the Visigoths. It was held by the Moors beginning in ad 7 1 1 . In 1262 Cadiz was captured by Alfonso X of Castile-Leon. The city enjoyed great prosperity as a centre for Spanish trade with the American colonies in the 16th– 1 8th centuries (see Sevilla). It now has naval and mercantile shipbuilding yards.

Cadiz, Bay of Inlet of the Gulf of Cadiz, southwestern Spain. An inlet indenting the coast of Cadiz province, it receives the Guadalete River and is partially protected by the Isle of Leon, on which the port of Cadiz is located. The Spanish-U.S. air and naval base at Rota is situated on the bay.

cadmium Metallic chemical element, chemical symbol Cd, atomic number 48. It normally occurs along with other metals, especially zinc, in ores. A silvery white metal capable of taking a high polish, cadmium does not corrode under alkaline (see alkali) conditions; one of its major uses is in electroplating other metals and alloys to protect them. Because it absorbs neutrons effectively, it is used in control rods in some nuclear reactors. Its compounds, in which it has valence 2, are very toxic. They are used as pigments, as phosphors in television and computer monitor screens, as

pesticides, and in photographic applications and analytical chemistry.

Cadmus In Greek mythology, the son of the king of Phoenicia, brother of Europa, and founder of Thebes. When Zeus carried off Europa, Cadmus was sent to find her. The Delphic oracle ordered him to end his search, follow a cow, and build a town where it lay down. That town became Thebes. He built the citadel of Thebes with the help of fierce armed men who sprang up where he sowed the teeth of a dragon he had slain. He married Harmonia, daughter of Ares and Aphrodite, and their five children included Semele. Cadmus was said to have brought the alphabet to Greece.

Cadogan \k3-'dog-9n\ / William, 1st Earl (b. 1672, Liscarton, County Meath, Ire. — d. July 17, 1726, Kensington, near London, Eng.) British soldier. He served as a trusted colleague with the duke of Marlborough in the War of the Spanish Succession. Later he became involved in intrigues to secure the succession for the Hanoverian George I (1714). He crushed a Jacobite rebellion in 1716, was granted an earldom in 1718, and was promoted to commander in chief in 1722.

caduceus \k3-'du-se-9s\ Staff carried by Hermes as a symbol of peace. It served as a badge of protection for ancient Greek and Roman heralds and ambassadors. It was originally depicted as a rod or olive branch ending in two shoots and decorated with garlands or ribbons; in later iconography the garlands became two snakes and a pair of wings was attached to the staff to represent Hermes' speed. The caduceus was adopted as a symbol of physicians because of its similarity to the staff of Asclepius.

caecilian \si-'sil-y3n\ Any of 155 species of wormlike amphibians found in humid regions from Mexico to northern Argentina and in Africa, Southeast Asia, and the Seychelles. The elongate, ringed, limbless body is 4-60 in. (10-150 cm) long. Colour ranges from blackish to pinkish tan. The tiny eyes are covered by skin and often by bone. A chemosensory projection lies between the eye and nostril. Some species lay eggs, which are guarded by the female and hatch into free-living larvae; other species bear live young. Caecilians spend their lives underground and eat worms and insects.

Caecus, Appius Claudius See Appius Claudius Caecus

Caedmon Ykad-msnX (fl. 658-680) Earliest known Old English Christian poet. According to Bede, he was a herdsman who received a divine call in a dream to sing of "the beginning of things" and began to utter "verses which he had never heard." He entered a monastery, where he produced vernacular poetry on sacred themes expounded to him by more learned brethren. Only the nine-line original dream hymn can be confidently attributed to him, but it set the pattern for almost all of Anglo-Saxon religious verse.

Caen Vka n \ City (pop., 1999: 113,987), northwestern France. Situated on the Orne River, it was the capital of lower Normandy in the 11th cen-

Incised redware cat effigy bowl, Caddoan from Louisiana; in the Museum of the American Indian, Heye Foundation, New York City

COURTESY OF THE NATIONAL MUSEUM OF THE AMERICAN

INDIAN, NEW YORK CITY

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tury. The English took it in 1346 and 1417 and held it until 1450. It suffered in the Wars of Religion and fell to the Protestants in 1562. During the French Revolution it was a centre for the Girondin movement. The city was severely damaged in the Allied Normandy Campaign (1944), but it was rebuilt. Notable structures include the 11th-century abbey and the university. Caen is a transportation centre and manufactures automobiles and electrical equipment.

Caere \'k!-ra\ Ancient city, Etruria. Located northwest of Rome near the modern city of Ceveteri, it was an important trading centre. Brought under Roman control in 253 bc, it prospered as part of the empire but declined in later centuries. The derived Latin word caeremonium (source of English ceremony) reflects the Etruscan fascination with divination and prophecy. Tomb chambers have yielded gold and silver objects, which show an Orientalizing tendency in the Etruscan art of the 7th century bc.

CaernarfonVklr-'nar-vo^kar-'nar-von\ Town (pop., 2001: 9,611), administrative centre of Gwynedd county and county seat of the historic county of Caernarvonshire, Wales.

Located near the west end of the Menai Strait, it was the site of a Roman fort, Segontium, built c. ad 75. After the Roman withdrawal (c.

380-390), it was the seat of local chieftains. The township was completely transformed by Edward I after his conquest of Wales in 1282-83. The imposing castle he built (birthplace of his son Edward II) has been preserved, and since 1911 it has been the site of the investiture of the prince of Wales.

Caesar, Irving orig. Isidor Caesar (b. July 4, 1895, New York, N.Y., U.S. — d. Dec. 18, 1996, New York City) U.S. lyricist. Caesar worked with Henry Ford during World War I before turning to songwriting. Working with various collaborators, he provided the lyrics for such standards as “Swanee,” “Sometimes I’m Happy,” “Crazy Rhythm,” and “Tea for Two,” one of the most frequently recorded tunes ever written.

Caesar, (Gaius) Julius (b. July 12/13, 100, Rome — d. March 15, 44 bc, Rome) Celebrated Roman general, statesman, and dictator. A patrician by birth, he held the prominent posts of quaestor and praetor before becoming governor of Farther Spain in 61-60. He formed the First Triumvirate with Pompey and Marcus Licinius Crassus in 60 and was elected consul in 59 and proconsul in Gaul and Illyria in 58. After conducting the Gallic Wars, during which he invaded Britain (55, 54) and crossed the Rhine (55, 53), he was instructed by the Senate to lay down his command, Senate conservatives having grown wary of his increasing power, as had a suspicious Pompey. When the Senate would not command Pompey to give up his command simultaneously, Caesar, against regulations, led his forces across the Rubicon River (49) between Gaul and Italy, precipitating the Roman Civil War. Pompey fled from Italy but was pursued and defeated by Caesar in 48; he then fled to Egypt, where he was murdered. Having followed Pompey to Egypt, Caesar became lover to Cleopatra and supported her militarily. He defeated Pompey’ s last supporters in 46-45. He was named dictator for life by the Romans. He was offered the crown (44) but refused it, knowing the Romans’ dislike for kings. He was in the midst of launching a series of political and social reforms when he was assassinated in the Senate House on the ides of March by conspirators led by Cassius and Brutus. His writings on the Gallic and Civil wars are considered models of classical historiography.

Caesar, Sid (b. Sept. 8, 1922, Yonkers, N.Y., U.S.) U.S. comedian. He began his career as a band musician but switched to comedy. Noted for his pantomime skills and his ability to mimic foreign languages at high speed, he performed comic routines in live television shows and costarred with Imogene Coca (1908-2001) and Carl Reiner in the popular comedy variety program Your Show of Shows (1950-54). He created his own Caesar’s Hour (1954-57) and later appeared in television specials.

Caesar Augustus See Caesar Augustus

Caesarea \,se-z3-'re-9\ modern Horbat Qesari Vk6r-bat-'ka-sa-re\ Ancient seaport, Palestine. Located on the coast of present-day Israel south of the city of Haifa, it was originally a Phoenician settlement. Taken by the Romans and rebuilt in the 1st century bc by Herod the Great, it was renamed for his patron Augustus. The capital of the Roman province of Judaea in ad 6, it was the site of an early Christian church and was often visited by St. Paul. It later declined under Byzantine and Arab rule and was destroyed by the Mamluk sultan Baybars I in the 13th century.

caesaropapism X.se-zo-ro-'pa-.pi-zomX Political system in which the head of the state is also the head of the church and supreme judge in religious matters. It is often associated with the Byzantine Empire, where emperors presided over church councils and appointed patriarchs. The term has also been applied to other historical eras, including the rule of Tsar Peter I, who made the Russian Orthodox Church a department of the state, and the reign of Henry VIII in England.

caffeine Heterocyclic comfound that, like other alkaloids, has marked physiological effects. It occurs in coffee beans, tea leaves, kola nuts, cacao, mate, and guarana and in the products made from them. Its stimulating effect on the central nervous system, heart, cardiovascular system, and kidneys makes it medically useful in treating respiratory depression caused by overdose of barbiturates, morphine, or heroin. Its positive effects can include improved motor performance, decreased fatigue, increased alert-

ness, and enhanced sensory activity. Excessive caffeine can produce irritability, anxiety, insomnia, and potentially serious symptoms such as heart irregularities and delirium. Much of the caffeine included in many over-the-counter stimulants, cold remedies, and painkillers has been extracted during production of decaffeinated coffee and tea.

Cagayan de Oro X.ka-ga-'yan-da-'o-roX City (pop., 2000: 461,877), northern Mindanao, Philippines. Located along the Cagayan River near the head of Macajalar Bay, it was established as a mission station in the 17th century and fortified by the Spaniards. Chartered as a city in 1950, it has become northern Mindanao’s transportation and commercial hub.

Cagayan River or Rio Grande de Cagayan River, northeastern Luzon, Philippines. Flowing north 220 mi (354 km) to the port of Aparri on the Babuyan Channel, it is the longest river in Luzon and is navigable for much of its course. Its chief tributary is the Chico. Its valley, 50 mi (80 km) wide, is agriculturally important.

Cage, John in full John Milton Cage, Jr. (b. Sept. 5, 1912, Los Angeles, Calif., U.S. — d. Aug. 12, 1992, New York, N.Y.) U.S. avant-garde composer and writer. The son of an inventor. Cage studied music with Arnold Schoenberg and Henry Cowell. From the early 1940s he was closely associated with the choreographer Merce Cunningham. Though he began as a 12-tone composer (see serialism), by 1943 his sonic experiments had marked him as notably original. He soon turned to Zen Buddhism and concluded that all activities that make up music are part of a single natural process and that all sounds are potentially musical; thenceforth he advocated indeterminism and endeavoured to ensure randomness in his works, using increasingly inventive notation and often relying on the Confucian classic Yijing. By the 1960s he had expanded into the realm of multimedia. His disparate works include Bacchanale for prepared piano (1938), Imaginary Landscape No. 4 for 12 radios (1951), Fontana Mix for tape (1958), HPSCHD for seven harpsichords, 51 tapes, and nonmusical media (1969), and Roaratorio (1979). His widely read books include Silence (1961), A Year from Monday (1967), Notations (1969), and M (1973). His international influence was far greater than that of any previous American composer.

Cagliari Vkal-ya-re\ ancient Caralis City (pop., 2001 prelim.: 158,351), capital of Sardinia, Italy. Located on the southern coast of the island of Sardinia, Cagliari was founded by the Phoenicians. Held successively by Rome, the Saracens, Pisa, Spain, and Austria, it passed with the rest of Sardinia to the house of Savoy in 1718. Long the military headquarters of the island, Cagliari was bombed heavily in World War II. The rebuilt harbour is Sardinia’s principal port.

Cagney, James (b. July 17, 1899, New York, N.Y., U.S. — d. March 30, 1986, Stanfordville, N.Y.) U.S. actor. He toured in vaudeville as a song-and-dance man before starring in the successful Broadway musical Penny Arcade (1929). He played the first in a series of pugnacious criminal roles in the film Public Enemy (1931), followed by Angels with Dirty Faces (1938) and White Heat (1949). As George M. Cohan in Yankee

Gold fibula from the Regolini-Galassi tomb, Caere, 7th century bc; in the Vatican Museum.

SCALA/ART RESOURCE, NEW YORK

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Doodle Dandy (1942, Academy Award) he showed off his dance skills and streetwise charm. Later films include Mister Roberts (1955) and Ragtime (1981).

Cahn, Sammy orig. Samuel Cohen (b. June 18, 1913, New York, N.Y., U.S. — d. Jan. 15, 1993, Los Angeles, Calif.) U.S. song lyricist. He became a professional songwriter while still a teenager and later formed a songwriting team with Saul Chaplin; their first hit was “Rhythm Is Our Business” (1935). With Jule Styne he collaborated on songs for many films and musicals, including “Three Coins in the Fountain” (1954, Academy Award). In 1955 Cahn and Jimmy Van Heusen formed a partnership and went on to write dozens of songs for Frank Sinatra, whose recordings won them Academy Awards for “All the Way,” “High Hopes,” and “Call Me Irresponsible.”

Caicos Islands See Turks and Caicos Islands

Caillaux \ka-'yo\, Joseph (-Marie-Auguste) (b. March 30, 1863, Le Mans, France — d. Nov. 22, 1944, Mamers) French politician. Serving several times as minister of finance, he was an early but unsuccessful advocate of a national income tax. He was named premier in 1911 but was forced to resign after negotiating a controversial treaty with Germany over the second of the Moroccan crises. Later his opposition to World War I and friendship with German agents led to conviction on charges of corresponding with the enemy. Granted amnesty in 1924, he was later elected to the Senate and became head of the Commission of Finance (1927^10).

Caillebotte \ka-y3-'bot\, Gustave (b. Aug. 19, 1848, Paris, Fr. — d. Feb. 21, 1894, Gennevilliers) French painter and art collector. Born to a wealthy family, he was a naval architect by profession. He pursued his interest in painting at the Ecole des Beaux- Arts and became a prolific painter of contemporary subjects, town and country views, still lifes, and boating scenes. In Caillebotte’ s masterpiece, Paris Street; Rainy Day (1877), he used bold perspective to create a monumental portrait of a Paris intersection. In addition to his own painting, Caillebotte was the chief organizer, promoter, and financial backer of the Impressionist exhibitions, and he purchased works by Edouard Manet, Edgar Degas, Claude Monet, Paul Cezanne, and others. He bequeathed his collection to the state, and in 1 897 it formed the basis of the first Impressionist exhibition in a French museum. See Impressionism.

caiman Vka-monV Any member of several species of Central and South American reptiles of the alligator family. Like the rest of the crocodile order, caimans are amphibious, lizardlike carnivores. They live along the

edges of rivers and other bodies of water, and reproduce by laying hard-shelled eggs in nests built and guarded by the female. The largest species is the black caiman (Melanosuchus niger), a potentially dangerous animal with a maximum length of about 15 ft (4.5 m). Average lengths for the other species (genera Caiman and Paleosuchus) are 4-7 ft (1.2-2. 1 m).

Cain and Abel In the Hebrew scriptures, the sons of Adam and Eve. According to Genesis, Cain, the firstborn, was a farmer, and his brother Abel was a shepherd. Cain was enraged when God preferred his brother's sacrifice of sheep to his own offering of grain, and he murdered Abel. When God asked where Abel was, Cain pretended ignorance, saying, "Am I my brother's keeper?" God punished Cain by sending him into exile but marked him with a sign as a warning to others, promising that he would be avenged if he were killed.

cairn terrier Breed of terrier developed in Scotland to rout animals that prey on game. The modern breed's characteristics are carefully patterned on those of the dog's ancestor, a 17th-century terrier of the Isle of Skye. This short-legged dog has a short, broad face. Its coarse coat is usually bluish gray, tan, or pale yellowish brown. Generally active, hardy, alert, and spirited, it is valued as a pet and watchdog. It stands 9-10 in. (23-25.5 cm) high and weighs about 13-14 lbs (6-6.5 kg).

Cairngorm Mountains Vkam- I g6rm\ Mountain range, northeastern Scotland. It is located in the Highlands between the Spey and Dee river valleys; its highest peak is Ben Macdui, at 4,296 ft (1,309 m) the second-highest (after Ben Nevis) in the British Isles. Since World War II winter sports have developed in the area. It is a chief source of the cairngorm variety of quartz.

Cairo Vkl-ro \ Arabic Al-Qahirah \al-'ka-he-r3\ City (pop., 1996: city, 6,789,479; 1999 est.: metro, area, 10,345,000), capital of Egypt. Located on the banks of the Nile River near the site of a Roman city captured by

the Arabs in 641, Old Cairo (Al-Fustat) was then built by the Arabs as a military camp. Cairo's newer section (Al-Qahirah) was built by the Fajimid dynasty (c. 968) and was made the capital in 973. From the 13th century, as the capital of the MamlOk dynasty, it reached its greatest prosperity as a trade and cultural centre. Occupied by French forces under Napoleon I in 1798, it was held by the French for three years. In World War II (1939—45) it was a base of operations for British and U.S. forces and was also the site of two conferences by the Allied Powers (see Cairo conferences). The ancient metropolis is a blend of old and new. East and West. It is the centre of the largest urban agglomeration in the Middle East and Africa, and it is the chief cultural centre of the Arab world. Its most noteworthy landmark is the pyramid complex of Giza, located at the southwestern edge of the city. A manufacturing centre, it is also the site of several important universities and colleges.

Cairo conferences (November-December 1943) Two meetings held in Cairo during World War II. At the first, Winston Churchill and Franklin Roosevelt discussed plans for the Normandy Invasion (see Normandy Campaign). With Chiang Kai-shek, they announced their goal of stripping Japan of all the territories it had seized since 1914 and of restoring Korea to independence. At the second conference, Churchill and Roosevelt tried unsuccessfully to persuade Turkey's Pres. Ismet InonO to bring his country into the war on the side of the Allies.

Caishen or Ts'ai-shen Vtsi-'shonN Chinese god of wealth, believed to bestow on his devotees the riches carried about by his attendants. A Ming-dynasty novel relates that a hermit, Zhao Gongming, employed magic to support the collapsing Shang dynasty. He was killed by Jiang Ziya, a supporter of the Zhou dynasty. Rebuked for causing the death of a virtuous man, Jiang apologized in a temple, extolled Zhao's virtues, and canonized him as the god of wealth. During Chinese New Year, incense is burned in Caishen' s temple and the greeting "May you become rich" is exchanged.

caisson \'ka-,san\ In engineering, a type of foundation most commonly used underwater for a bridge, but sometimes used in building construction. It is a large hollow structure that is sunk down through the earth by workers excavating from inside it; ultimately it becomes a permanent part of the pier. There are three types: the open caisson, open at both top and bottom; the box caisson, closed at the bottom; and the pneumatic caisson, with an airtight chamber to accommodate submerged workers. Caisson columns, typically 2 ft (0.6 m) or more in diameter, may be used as an alternative to bearing piles. A round hole is dug or bored to a stable layer of earth and temporarily supported by a steel shell, then filled with concrete poured around a cage of reinforcing bars.

caisson disease See decompression sickness

Caitanya Md-'tan-yoV Sri Krishna orig. Vishvambhara Mishra

(b. 1485, Navadvipa, Bengal, India — d. 1533, Puri, Orissa) Indian Hindu mystic. Born into a Brahman family, he became a teacher. While on a pilgrimage to perform his father's death-anniversary ceremony, he had a profound religious experience, and he returned home indifferent to worldly matters. Disciples joined him in worship that consisted of choral singing of the name of God, often accompanied by dance movements and ending in trance states. He took his new name on initiation as an ascetic in 1510. In his lifetime his following came to constitute a major sect of Vaishnavism (see Caitanya movement). According to tradition, he died when he walked into the ocean while lost in a devotional trance.

Caitanya movement Emotional form of Hinduism that developed in the 16th century, inspired by the mode of worship originated by Caitanya. Centred in Bengal, the movement was organized by Caitanya' s followers Nityananda and Advaita. Bhakti (devotion) is central and takes the form of singing for hours, with accompaniment, hymns that repeat God's name. Caitanya himself came to be worshiped as an incarnation of both Krishna and his beloved, Radha. Caitanya, Nityananda, and Advaita are regarded as the movement's three masters. A group of six of Caitanya' s disciples developed its theology and devotional literature. Its present leaders are mostly lineal descendants of the early disciples. See also Hare Krishna MOVEMENT.

Cajun Any descendant of French Canadians who in the 18th century were driven by the British from the captured French colony of Acadia (now Nova Scotia and adjacent areas) and settled in the fertile bayou lands of southern Louisiana, U.S. Many Cajuns speak a dialect of North American French. U.S. census figures for Cajuns are deceptive; although in 2000

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only some 85,000 people reported themselves to be Acadian/Cajun, the census form also included a French Canadian category, which may have confused the issue. Experts suggest that there are some 100,000 Cajuns in Texas and from 500,000 to 700,000 Cajuns in Louisiana. In recent decades Cajun cuisine, noted for its use of spicy seasonings, and zydeco music have become popular among non-Cajuns.

cakravartin See chakravartin

Calabar \'ka-l3-,bar\ City (pop., 1991.: 310,839), southeastern Nigeria. Lying along the Calabar River above its confluence with the Cross River, it was settled in the 17th century by the Efik and became an important trading centre for Europeans arriving on the African coast. After accepting British protection in 1884, it served as capital of a British protectorate until British administrative headquarters were moved to Lagos in 1906. With its natural harbour, it remains an important port.

calabash Tree (Crescentia cujete) of the trumpet-creeper family (Bignoniaceae) that grows in Central and South America, the West Indies, and extreme southern Florida. It is often grown as an ornamental. It produces large spherical fruits, the hard shells of which are useful as bowls, cups, and other water containers when hollowed out. The fruit’s shell encloses a whitish pulp and thin, dark brown seeds. The tree bears funnel-shaped, light green and purple-streaked flowers and evergreen leaves. Fruits of the unrelated bottle gourd (Lagenaria siceraria) are also known as calabashes.

Calabria \ka-'la-bre-a\ Region (pop., 2001 prelim.: 1,993,274), southern Italy. Forming the “toe” of the Italian “boot,” it is a peninsula that separates the Tyrrhenian and Ionian seas. A mountainous area covering 5,823 sq mi (15,080 sq km), it has been subject to earthquakes. Its capital is Catanzaro. Founded as a Greek colony and known in ancient times as Bruttium, it was taken by the Romans in the 3rd century bc and gradually went into decline. It eventually passed to the Byzantines, who renamed it Calabria. Conquered by the Normans, it was united with the Kingdom of Naples in the 11th century ad. A stronghold of Italian republicanism until the Risorgimento, it became part of Italy after the 1860 expedition of Giuseppe de Garibaldi. Long a poor area dependent on farming, it underwent a land-reform system in the mid-20th century that promoted more diverse profitable crops.

caladium \ko-Ta-de-3m\ Any of the tropical New World tuberous herbaceous plants that make up the genus Caladium, in the arum family, widely cultivated for their showy, fragile-looking, variably coloured leaves. Caladiums are nonhardy bulbs used as potted plants indoors and in summer outdoor plantings. They keep surprisingly well if protected from chills and wintry drafts.

Calah \'ka-b\ modern Nimrud \ , nim-,rud\ Ancient city, Assyria. Lying south of modern Mosul, Iraq, it was founded in the 13th century bc by Shalmaneser I. It remained unimpor-

tant until the 9th century bc, when Ashurnasirpal II made it the capital of Assyria. It was the site of a religious building founded in 798 bc by Queen Sammu-remat (Semiramis of Greek legend). Excavations there have yielded thousands of carved ivories from the 9th-8th centuries bc.

Calais \ka-'le, ka-'la\ Seaport (pop., 1999: 77,333) on the Strait of Dover, northern France. Originally a fishing village built on an island, it was improved by the count of Flanders in 997 and fortified by the count of Boulogne in 1224. Calais was taken in 1347 by Edward III of England, and after 1450 it was the only remaining English possession in France. The 2nd duke de Guise took Calais from the English in 1558. In World War II it was a main objective in the German drive to the sea in 1940. It is an important passenger port and is near the French terminus of the Channel Tunnel. The city is famous for its lace and embroideries.

Calamity Jane orig. Martha Jane Cannary (b. May 1, 1852?, near Princeton, Mo.?, U.S. — d. Aug. 1, 1903, Terry, near Deadwood, S.D.)

U.S. frontierswoman. She grew up in Montana and worked in mining camps, where she acquired riding and shooting skills. In 1876 she settled in Deadwood, S.D., site of new gold strikes; her pursuits there included hauling goods and machinery to the outlying camps and working as a cook and a dance-hall girl.

There she probably first met Wild Bill Hickok, who would become her companion. In 1891 she married Charley Burke, and from 1895 she toured with Wild West shows in the Midwest. Facts about her life were embellished by contemporary feature-magazine writers.

Calatrava \,ka-la-'tra-va\. Order of Oldest military and religious order in Spain. It was founded in 1158 by two Cistercian monks who proclaimed a holy Crusade to defend the city of Calatrava against the Moors. By the 15th century the order had 200,000 members and became increasingly involved in Castilian domestic politics. In 1489 it was incorporated into the crown by Ferdinand V and Isabella I, who deemed that all

private armies had outserved their usefulness. It remained an honorary association of Spanish nobles until its dissolution in the 19th century.

calcedony See chalcedony

calcite Vkal-.siA Most common form of natural calcium carbonate (CaC0 3), a widely distributed mineral known for the beautiful development and great variety of its crystals. It occurs in stalagmites and stalactites and forms the structure of coral reefs. Calcite is the most important mineral in limestones and marbles used in the building, steel, chemical, and glass industries. Transparent crystals are called Iceland spar.

calcium Chemical element, one of the alkaline earth metals, chemical symbol Ca, atomic number 20. The most abundant metallic element in the human body, it is an essential part of bones and teeth and has many physiological functions (see calcium deficiency; tooth). It is the fifth most abundant element in Earth’s crust but does not occur naturally in the free state. In its compounds calcium has valence 2. It occurs in limestone, chalk, marble, dolomite, eggshells, pearls, coral, and many marine shells as calcium carbonate, or calcite; in apatite as calcium phosphate; in gypsum as calcium sulfate; and in many other minerals. It is used as an alloying agent and in other metallurgical applications; its alloy with lead is used in cable sheathing and grids for batteries. Calcite is used as a lime source, a filler, a neutralizer, and an extender; in pure form it is used in baking powder and as an antacid and calcium supplement. Calcium oxide (lime) and its product after water addition, calcium hydroxide (slaked lime), are important industrially. Other significant compounds are calcium chloride (a drying agent), calcium hypochlorite (a bleach), calcium sulfate (gypsum and plaster of Paris), and calcium phosphate (a plant food and stabilizer for plastics).

calcium deficiency Inadequate supply or metabolism of calcium, the main structural element of bones and teeth. Its metabolism is regulated by vitamin D, phosphorus, and hormones (see parathyroid gland). Calcium in the blood has roles in muscle contraction, nerve-impulse transmission, blood clotting, milk production, hormone secretion, and enzyme function, for which calcium is pulled from the bones if deficiency develops. Chronic deficiency may be a factor in the development of osteoporosis or osteomalacia (softening of bone) and may contribute to hypertension and colon cancer. Severe calcium deficiency (hypocalcemia), usually the result of a metabolic problem rather than a dietary deficiency, causes numbness, tingling, and painful muscle aches and spasms.

calcium oxide See lime

calculator Machine for performing arithmetic operations and certain mathematical functions automatically. Blaise Pascal devised a digital arithmetic machine in 1642. By the late 19th century, such machines had become smaller and easier to use, and desktop machines appeared in the early 20th century. Electronic data- processing systems in the mid-1950s led to the obsolescence of mechanical calculators. Miniature solid-state

Winged bull of alabaster, guardian of
a gate of the palace of Ashurnasirpal II
at Nimrud; in the Metropolitan
Museum of Art, New York City.

COURTESY OF THE METROPOLITAN MUSEUM OF ART, NEW VORK, GIFT OF JOHN D. ROCKEFELLER, JR, 1 932

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devices ushered in calculators that could perform mathematical functions in addition to basic arithmetic, and also store data and instructions in memory registers, providing programming capabilities similar to those of small computers.

calculus Field of mathematics that analyzes aspects of change in processes or systems that can be modeled by functions. Through its two primary tools — the derivative and the integral — it allows precise calculation of rates of change and of the total amount of change in such a system. The derivative and the integral grew out of the idea of a limit, the logical extension of the concept of a function over smaller and smaller intervals. The relationship between differential calculus and integral calculus, known as the fundamental theorem of calculus, was discovered in the late 17th century independently by Isaac Newton and Gottfried Wilhelm Leibniz. Calculus was one of the major scientific breakthroughs of the modem era.

Calcutta See Kolkata

Caldecott Vkol-do-koA, Randolph (b. March 22, 1846, Chester, Cheshire, Eng. — d. Feb. 12, 1886, St. Augustine, Fla., U.S.) British graphic artist and watercolourist. While working as a bank clerk, he began drawing for periodicals such as London Society, and, after he moved to London, Punch and Graphic. He developed a gently satirical style and achieved success with illustrations for Washington Irving’s books The Sketch Book (1875) and Bracebridge Hall (1876). Caldecott is best known as an illustrator of children’s books, including William Cowper’s John Gilpin (1878) and Oliver Goldsmith’s Elegy on a Mad Dog (1879). Always frail in health, he died at age 39 in Florida, where he had gone to improve his condition. Since 1938 the Caldecott Medal has been awarded annually to the illustrator of the most distinguished U.S. picture book for children.

Colder Vkol-dsrX, Alexander (Stirling) (b. July 22, 1898, Lawnton, Pa., U.S.— d. Nov. 11, 1976, New York, N.Y.) U.S. sculptor. He was the son and grandson of sculptors, and his mother was a painter. He studied mechanical engineering, and in 1923 attended the Art Students League, where he was influenced by artists of the Ash Can school. In 1924 he contributed illustrations to the National Police Gazette. In 1926 he moved to Paris and began making toylike animals and circus figures of wood and

wire; from these he developed his famous miniature circus. In the 1930s he became well known in Paris and the U.S. for his wire sculptures, as well as for portraits, continuous-line drawings, and abstract, motor-driven constructions.

He is best known as the inventor of the mobile, a forerunner of kinetic sculpture. He also constructed nonmovable sculptural works known as stabiles. Although Calder's early mobiles and stabiles were relatively small, he increasingly moved toward monumentality in his later works. His art was recognized with many large-scale exhibitions.

caldera \kal-'der-9\ Large, bowl-shaped volcanic depression that forms when the top of a volcanic cone collapses into the space left after magma is ejected during a violent volcanic eruption. The term is Spanish for "caldron." Subsequent minor eruptions may build small cones on the floor of the caldera which may still later fill up with water; an example is Crater Lake in Oregon.

Calderon de la Barca V.kal-do-'ron-da-b-'bar-koV, Pedro (b. Jan. 17, 1600, Madrid, Spain — d. May 25, 1681, Madrid) Spanish playwright. He abandoned religious studies in 1623 to write plays for the court of Philip IV of Spain. His secular plays included The Surgeon of His Honour (1635), Life Is a Dream (1638), and his masterpiece. The Daughter of the Air (1653). His many plays on religious themes include The Constant Prince (1629) and The Wonder-Working Magician (1637). He also created 76 one-act religious dramas, notably The Great Theatre of the World (c. 1635) and The Faithful Shepherd (1678). Considered the successor to Lope de Vega as the greatest playwright of the Spanish Golden Age, he was noted for his well-constructed plots and his preoccupation with the vanity of human existence.

Caldwell, Erskine (b. Dec. 17, 1903, Coweta county, Ga., U.S. — d. April 11, 1987, Paradise Valley, Ariz.) U.S. author. Caldwell became familiar with poor sharecroppers through his father's missionary work. Fame arrived with Tobacco Road (1932), a controversial novel whose title became a byword for rural squalor; adapted as a play, it ran more than seven years on Broadway. God's Little Acre (1933), also a best-seller, featured a cast of hopelessly poor degenerates. Like his other novels and stories about the rural Southern poor, they mix violence and sex in grotesque tragicomedy. He also wrote the text for documentary books with photographs by Margaret Bourke-White, whom he married.

Caledonian orogenic \ l kal-9- , do-ne-3n-,or-3- , je-nik\ belt Range of mountains in northwestern Europe, extending in a southwest-northeast direction from Ireland, Wales, and northern England through Norway. The mountains developed in the period from the start of the Cambrian Period (543 million years ago) to the end of the Silurian Period (c. 417 million years ago). Remnants also exist in eastern Greenland.

calendar System for dividing time over extended periods, such as days, months, or years, and arranging these divisions in a definite order. A calendar is essential for the study of chronology, which reckons time by regular divisions, or periods, and uses these to date events. It is also vital

for any civilization that needs to measure periods for agricultural, business, domestic, or other reasons. The lunation, or period in which the moon completes a cycle of its phases (2914 days), is the basis for the month; most ancient calendars were collections of months. Days and seasons, which are a solar phenomena, do not have periods that evenly divide, so ancient calendars employed various means, such as the periodic insertion of an intercalary month, to reconcile the months with the seasons. The Gregorian calendar used almost universally today is a modification of the Julian calendar adopted by Julius Caesar, which used a 36514-day year with 1 2 months that came to have the number of days we know today. See also calendar, Jewish; calendar, Muslim; sidereal period.

calendar, French republican See French republican calendar

calendar, Jewish or Hebrew calendar Religious and civil dating system based on both lunar and solar cycles. In the calendar used today, a day is counted from sunset to sunset, a week comprises 7 days, a month has 29 or 30 days, and a year has 12 lunar months plus approximately 11 days (or 353, 354, or 355 days). In order to bring the calendar in line with the annual solar cycle, a 13th month of 30 days is added in the 3rd, 6th, 8th, 11th, 14th, 17th, and 19th years of a 19-year cycle. Therefore, a leap year may have from 383 to 385 days. The Jewish calendar in use today was popularly accepted around the 4th century ad and is based on Biblical calculations placing the creation in 3761 bc.

calendar, Muslim or Islamic calendar Dating system used in the Muslim world and based on a year of 12 months, each month beginning approximately at the time of the new moon. The months are alternately 30 and 29 days long except for the 12th, Dhu al-Hijjah, the length of which is varied in a 30-year cycle intended to keep the calendar in step with the true phases of the moon. In 11 years of this cycle, Dhu al-Hijjah has 30 days, and in the other 19 years it has 29. Thus the year has either 354 or 355 days. No months are added as in leap years, so the named months

Colder, photograph by Yousuf Karsh, 1966.

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do not remain in the same seasons but retrogress through the entire solar, or seasonal, year (of about 36514 days) every 3 2 Vi solar years.

calendering Process of smoothing and compressing a material (nota-

bly paper) during production by passing a continuous sheet through a number of pairs of heated rolls. The rolls in combination are called calenders; they are made of hardened steel or steel covered with fiber. In paper production, they typically exert a pressure of 500 lbs per linear in. (89 kg per cm). Coated papers are calendered to obtain a smooth, glossy finish. Calendering is also widely used in the manufacture of textiles, coated fabrics, and plastic sheeting.

calendula \k3-'len-j9-b\ Any herbaceous plant of the small genus Calendula, in the composite family, found in temperate regions. Calendulas produce yellow-rayed flowers. The pot marigold (C. officinalis) is grown especially for ornamental purposes.

Calgary \'kal-go-re\ City (pop., 2001: city, 878,866; metro, area, 951,395), southern Alberta, Canada. It was founded in 1875 as a fort on the Bow River for the Northwest Mounted Police. The arrival of the Canadian Pacific Railway in 1883 aided its growth, as did the discovery of nearby oil and gas fields in 1914 and 1947. Its major industries are petroleum refining, meatpacking, and lumbering. The annual Calgary Stampede, founded in 1912, is a world-famous rodeo and celebration of the Old West.

Calgary, University of Public university in Calgary, Alberta, Canada. It was founded in 1945 as part of the University of Alberta and gained full autonomy in 1966. It has faculties of education, engineering, environmental design, fine arts, graduate studies, humanities, law, management, medicine, nursing, physical education, science, social sciences, and social work. It has special programs devoted to space research, international development, gifted education, and world tourism.

Calhoun \kal-'hun\, John C(aldwell) (b. March 18, 1782, Abbeville district, S.C., U.S. — d. March 31,

1850, Washington, D.C.) U.S. politician. A graduate of Yale University, he became an ardent Jeffersonian Republican and was elected to the U.S. House of Representatives (1811-17). As a leader of the War Hawks, he introduced the declaration of war against Britain in June 1812 (see War of 1812). From 1817 to 1825 he served as U.S. secretary of war. He was elected vice president in 1824 (under John Quincy Adams) and again in 1828 (under Andrew Jackson). In the 1830s he became an extreme advocate of strict construction of the U.S. Constitution, a champion of states' rights, a defender of slavery, and a supporter of nullification. In 1832 he resigned the vice presidency and was elected to the U.S. Senate, where he served until 1850; he was briefly secretary of state in 1844-45. His exuberant defense of slavery as a “positive good” aroused strong anti-Southern feeling in the free states.

Cali Vka-le\ City (pop., 1999 est.: 2,077,386), western Colombia. Lying on both sides of the Cali River, it was founded in 1536. Located far from the coast, it did not develop economically until the 20th century, when the upper Cauca River was harnessed to generate electrical power and prevent flooding. It is a major service centre for area products and rivals Bogota, Barranquilla, and Medellin as an industrial centre. Beginning in the late 20th century, Cali became notorious for its trade in illegal narcotics.

calico cal' In North America, a blotched or spotted domestic cat, usually predominantly white with red and black patches (a pattern also called tortoiseshell-and- white). Because genetic determination of some coat colours in cats is linked to the sex chromosome, calicoes are almost always female.

California State (pop., 2000: 33,871,648), western U.S. Lying on the Pacific Ocean, it is bordered by Mexico and the U.S. states of Oregon, Nevada, and Arizona. California is the largest state in population and the

third largest in area (158,647 sq mi [410,895 sq km]), extending about 800 mi (1,300 km) north to south and 250 mi (400 km) east to west. Its capital is Sacramento. Within 85 mi (137 km) of each other lie Mount Whitney and Death Valley, the highest and lowest points in the 48 contiguous states. It was inhabited originally by American Indians. The first European coastal expansion took place in 1542-43 when Juan Cabrillo established a Spanish claim to the area. The first mission was established by Junipero Serra at San Diego in 1769. The region remained under Spanish and, after the 1820s, Mexican control until it was taken by U.S. forces in the Mexican War and ceded to the U.S. by the Treaty of Guadalupe Hidalgo in 1848. Though settlement had begun by the U.S. in 1841, it was greatly accelerated by the 1848 gold rush. California was admitted to the Union in 1 850 as a nonslavery state under the Compromise of 1 850. Its already expanding population grew immensely in the 20th century. It has the largest economy of any U.S. state. It has suffered severe earthquakes, most destructively those of San Francisco in 1906 and 1989 and Los Angeles in 1994.

California, Gulf of or Sea of Cortes Gulf separating Baja California from the rest of Mexico. Its area is about 59,000 sq mi (153,000 sq km). Its waters were coloured by red plankton when 16th-century Spanish explorers named it Mar Bermejo (“Vermilion Sea”). Some geologists hold that the gulf is structurally part of the Pacific Ocean; others claim Baja California is pulling away from the continent as it moves north along the San Andreas Fault, allowing the gulf to form.

California, Lower See Baja California

California, University of U.S. public university with campuses at Berkeley (main campus), Davis, Irvine, Los Angeles, Merced, Riverside, San Diego (La Jolla), San Francisco, Santa Barbara, and Santa Cruz. Established in 1 868 in Oakland, it has become one of the largest university systems in the U.S. The Berkeley campus, which replaced the Oakland campus in 1873, remains a leader in scientific fields as well as in many other academic areas. In the 1930s researchers there produced the first cyclotron, isolated the human polio virus, and discovered several new chemical elements. The San Francisco campus, originally a medical college, joined the University of California in 1873 and remains a centre for medical research and education. The San Diego campus, founded as a

marine station, became part of the university in 1912; it includes the Scripps Institution of Oceanography. The Los Angeles branch (UCLA), founded in 1919, includes schools of law, medicine, and engineering. The Santa Barbara campus, originally founded as a teachers college, joined the university system in 1944. The Davis and Riverside campuses grew out of agricultural institutes and were added in 1959. To answer a growing need for broad-based education and research, the university opened campuses at Santa Cruz and Irvine in 1965 and added the Merced campus in 2005. The University of California operates nuclear research centres at Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory, and Los Alamos National Laboratory.

California Institute of Technology known as Caltech U.S.-based, highly select, private university and research institute in Pasadena. Established in 1891, it offers graduate and undergraduate instruction and research in pure and applied science and engineering. It is considered one of the world’s premier scientific research centres. In 1958 its Jet Propulsion Laboratory, in conjunction with NASA, launched Explorer I, the first U.S. satellite. Caltech operates astronomical observatories at such locations as Palomar Mountain, Owens Valley, and Big Bear Lake, Calif., and Mauna Kea, Hawaii. Other facilities include a seismology laboratory, a marine biology laboratory, and a centre for the study of radio astronomy.

California Institute of the Arts known as CalArts U.S. private institution of higher learning in Valencia. Created in 1961 through the merger of two other art institutes, it was the first in the U.S. to specialize in degree programs for the visual and performing arts. It consists of five schools — art, dance, film and video, music, and theatre — and a division of critical studies. All schools award B.F.A. and M.F.A. degrees. A community arts program sponsors work with young students in disadvantaged areas of Los Angeles.

California poppy Annual garden plant (Eschscholzia calif ornica) in the poppy family, native to the western coast of North America and naturalized in parts of southern Europe, Asia, and Australia. The flowers are usually pale yellow, orange, or cream in the wild, but whites and shades of red and pink have been developed in cultivation. The foliage is gray-

John Calhoun, detail of a daguerreotype by Mathew Brady, c. 1 849.

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green and feathery. The flowers open only in sunlight. They blossom all summer in northern climates and

into the winter in areas with mild winters.

Californian Indian Any member of the various North American Indian peoples living in and around present-day California, U.S. Of the many Californian groups, most were composed of independent territorial and political units that were smaller than the average groupings of other North American Indians. Food varied with the region inhabited (coastal peoples fished, desert peoples hunted and practiced marginal agriculture, etc.), as did style of housing. The peoples of California were politically stable, sedentary, and conservative and less in conflict with one another than was usually the case in other areas of North America; neighbouring groups often developed elaborate systems of economic exchange of goods and services. The Californian Indians reached peaks of cultural attainment rarely seen among peoples depending almost wholly for subsistence on hunting, fishing, and the gathering of wild plant foods. Californian Indians had a renowned oral literature, and Californian basketwork is considered exquisite. See also Modoc; Northwest Coast Indian; Pomo; YuMAn.

Caligula \ka-'li-gya-l3\ officially Gaius Caesar (Germanicus) (b.

Aug. 31, ad 12, Antium, Latium— d. Jan. 24, 41, Rome) Roman emperor (37-41). Known by his childhood nickname, Caligula (“Little Boot”) was declared heir to the throne by Tiberius following the suspicious deaths of Caligula’s parents and brothers and probably connived in Tiberius’s death. Caligula suffered a severe illness seven months into his rule and began displaying mental instability, engaging in despotic caprice and cruelty. Restoring treason trials (38), he executed former supporters and extorted money from the citizens. He plundered Gaul in 40 and began planning to invade Britain. He made pretensions to divinity and declared his sister Drusilla a goddess on her death. Weary of his tyranny, a group of conspirators assassinated him.

caliper Instrument that consists of two adjustable legs or jaws for measuring the dimensions of material parts. Spring calipers have an adjusting screw and nut; firm-joint calipers use friction at the joint to hold the legs unmoving. Outside calipers measure thicknesses and outside diameters of objects; inside calipers measure hole diameters and distances between surfaces. Hermaphrodite calipers, which have one leg bent inward and one straight leg ending in a sharp point, are used for scribing lines at a specified distance from a flat or curved surface. See also micrometer.

caliph Vka-lof, 'ka-bf\ Arabic khalTfah ("deputy" or "successor") Title given to those who succeeded the Prophet Muhammad as real or nominal ruler of the Muslim world, ostensibly with all his powers except that of prophecy. Controversy over the selection of the fourth caliph, c Au, eventually split Islam into the Sunnite and ShYite branches. 'All’s rival, M u'awiyah I, established the Umayyad dynasty of caliphs, which produced 14 caliphs (661-750). The 'Abbasid dynasty (750-1258), the most widely observed caliphate, associated with 38 caliphs, moved the capital

from Damascus to Baghdad. The Mongol conquest of Baghdad in 1258 effectively ended the dynasty. Other Muslim leaders created caliphates with limited success. The Fattmid dynasty proclaimed a new caliphate in 920; c Abd al- Rahman III announced one in opposition to both the 'Abbasids and the Fatimids in 928. A scion of the 'Abbasid line was set up by the MamlGk dynasty as a sort of puppet caliph after 1258. This caliphate exercised no power whatsoever, and, from 1517 until it was abolished by the Republic of Turkey in 1924, it resided in Istanbul under the control of the Ottoman Empire. Modern Muslim militants consider the abolition of the caliphate a catastrophic event, and its return has been a central pillar of their political program.

calisthenics Systematic rhythmic bodily exercises (e.g., jumping jacks, push-ups), usually performed without apparatus. Calisthenics promote strength, endurance, flexibility, and general well-being by placing regular demands on the cardiovascular system. The exercises, initially conceived as primarily for women, arose in the 19th century in Germany and Sweden. Catharine Esther Beecher in the U.S. advocated women’s calisthenics. As their health benefits became known, they became an activity for both sexes.

Calixtus \k3-'lik-st3s\ II orig. Guido of Burgundy (d. Dec. 13/14, 1124, Rome) Pope (1119-24). As archbishop of Vienne in Lower Burgundy, he became known as an advocate of reform and an opponent of Holy Roman emperor Henry V. Elected pope in 1119, he condemned lay investiture and excommunicated Henry. They were later reconciled, and the Concordat of Worms (1122) ended the Investiture Controversy. Calixtus called the first Lateran Council (1123), which secured peace between church and empire for the next 35 years. His bull Etsi Judaeis (1120) protected Roman Jews.

calla Either of two distinct kinds of plants of the arum family. Calla palustris is known as the arum lily, water arum, or wild calla. The common name calla is also generally given to several species of Zantedeschia, often called calla lilies. The handsome C. palustris occurs widely in wet places in cool, northern temperate and subarctic regions. It has heart-shaped leaves, showy white floral leaves, and clusters of brilliant red berries. Its juice is violently poisonous. The most important of the calla lilies, all native to South Africa, is the common florist’s calla (Z. aethiopica), a stout herb with a fragrant white spathe and arrow-shaped leaves; a popular indoor plant, it is grown commercially for cut flowers.

Callaghan \'ka-b-,han\ (of Cardiff), (Leonard) James Callaghan, Baron (b. March 27, 1912, Portsmouth, Hampshire, Eng. — d. March 26, 2005, Ringmer, East Sussex) British politician. A trade union official, he entered the House of Commons as a Labour Party member in 1945. He served in Labour governments as chancellor of the Exchequer

(1964-67), home secretary (1967-70), and foreign secretary (1974-76) before becoming prime minister (1976-79). A moderate within his party, he tried to stem the vociferous demands of the trade unions. After a series of paralyzing labour strikes in 1978-79 (the “Winter of Discontent”), his government was brought down by a parliamentary vote of no confidence. He was created a life peer in the House of Lords in 1987.

Callaghan \'ka-b-,han\, Morley (Edward) (b. Sept. 22, 1903, Toronto, Ont., Can. — d. Aug. 25, 1990, Toronto) Canadian novelist and short-story writer. Callaghan received a law degree in 1928 but never practiced. He won acclaim for the short-story collection A Native Argosy (1929). His first novel, Strange Fugitive (1928), describes the destruction of a social misfit, a type that recurs in his fiction. Subsequent novels, including They Shall Inherit the Earth (1935) and The Loved and the Lost (1951, Governor General’s Award), emphasize Christian love as an answer to social injustice. That Summer in Paris (1963) describes Callaghan’s friendship with F. Scon Fitzgerald and Ernest Hemingway. Later works include A Fine and Private Place (1975) and A Time for Judas (1983).

Callahan, Harry (Morey) (b. Oct. 22, 1912, Detroit, Mich., U.S. — d. March 15, 1999, Atlanta, Ga.) U.S. photographer. He had no formal training in photography and first developed an interest in it in 1938. In 1941 Ansel Adams’s photographs inspired him to develop his own style. His subjects included landscapes, cityscapes, and unconventional portraits of his wife and daughter. He was best known as a teacher; he was head of the photography department at the Chicago Institute of Design (1949-61) and developed the photography department at the Rhode Island School of Design (1961-76). In 1980 two collections of his works were published, Water’s Edge and Harry Callahan: Color, 1945-1980.

Callao \ka-'ya-o\ City (pop., 1996 est.: 407,904), chief seaport, Peru. It was founded in 1537 by Francisco Pizarro on Callao Bay west of Lima. As the leading shipping point for gold and silver taken by Spanish conquistadores from the Incas, it was frequently assaulted by pirates and by Spain’s European rivals. It was destroyed by a tidal wave in 1746, then rebuilt near its original site. It withstood several sieges by Spanish forces during the wars for independence. The revolutionary leader Simon Bou-

Arum lily (Calla palustris)

INGMAR HOLMASEN

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var landed here in 1823, and three years later it was the scene of the final Spanish surrender to rebel forces. It suffered heavy earthquake damage in

1940 but has since expanded and modernized.

Callas Vka-bs\, Maria orig. Cecilia Sophia Anna Maria Kalogeropoulos (b. Dec. 2, 1923, New York, N.Y., U.S. — d. Sept. 16, 1977, Paris, France) U.S. soprano of Greek descent. In 1937 she moved to Greece with her mother and made her debut there in 1939. She gained an international reputation for her performance in La Gioconda at the 1947 Verona Festival. She continued to sing heavy dramatic roles, including Giacomo Puccini's Turandot and Richard Wagner's Kundry, until the conductor Tullio Serafin (1878-1968) convinced her to shift to the bel canto repertoire, for which she became famous. Her signature role was Vincenzo Bellini's Norma. Though her voice was imperfect, her extraordinary range, dramatic stage presence, and mastery of difficult roles made her the most famous opera star of her day. Her fiery temperament and her flamboyant and demanding personality made her an international celebrity; she was the consummate diva.

calligraphy \ko-Tig-r3-fe\ Art of beautiful, stylized, or elegant handwriting or lettering with pen or brush and ink. It involves the correct formation of characters, the ordering of the various parts, and the harmony of proportions. In the Islamic and Chinese cultures, calligraphy is as highly revered as painting. In Europe in the 14th- 16th century, two scripts developed that influenced all subsequent handwriting and printing: the roman and italic styles. With the invention of modern printing (1450), calligraphy became increasingly bold and ornamental.

Callimachus (fl. late 5th century bc) Greek sculptor. Though little is known of his life, he reputedly invented the ornate Corinthian capital (see order) after seeing leaves growing around a basket placed on a girl's tomb. He was noted for the elaborate carving and detailed draperies of his sculptures, which survive only as Roman copies.

Callimachus Vko-'lim-o-kosN (b. c. 305, Cyrene, North Africa — d. c. 240 bc) Greek poet and scholar. He migrated to Egypt, where he worked at the Library of Alexandria. Of his voluminous writings, only fragments survive. His best-known poetical work is the Causes (c. 270 bc), a medley of obscure tales explaining the origins of customs, festivals, and names. He is the most representative poet of the erudite and sophisticated Alexandrian school. His most famous prose work is the Pinakes ("Tablets") in 120 books, a catalog of the authors whose works were held in the library.

Calliope or Kalliope \k3-'lI-3-pe\ In Greek mythology, the foremost of the nine Muses and the patron of epic poetry. She and King Oeagrus of Thrace were the parents of Orpheus. She also bore Apollo two sons. Hymen and Ialemus. Other versions of the myth say she was the mother of Rhesus, king of Thrace, or the mother of Linus, inventor of melody and rhythm.

Callipolis See Gallipoli

Callisto \k3-'lis-to\ In Greek mythology, a nymph and a hunting companion of Artemis. Though she vowed never to wed, she was seduced by Zeus, who turned her into a she-bear to conceal his infidelity from the jealous Hera. She was then killed by Artemis during a hunt. Other versions hold that it was Artemis or Hera, enraged at her unchastity, who turned her into a bear. After her death Zeus placed her in the heavens as the constellation Ursa Major (Great Bear).

Callot \ka-'lo\, Jacques (b. 1592/93, Nancy, Fr. — d. March 24, 1635, Nancy) French etcher, engraver, and draftsman. He learned the technique of engraving in Rome. In 1612, at the court of the Medici family in Florence, he was employed to make pictorial records of pageants and feasts. He had a genius for caricature and the grotesque; his series of etchings The Miseries of War (1633), documenting the atrocities of the Thirty Years' War, was used as a source by Francisco de Goya. His output was prodigious; more than 1,400 etchings and 2,000 drawings survive. One of the greatest of all etchers, he was also one of the first major artists to practice the graphic arts exclusively.

Calloway, Cab orig. Cabell Calloway III (b. Dec. 25, 1907, Rochester, N.Y., U.S. — d. Nov. 18, 1994, Hockessin, Del.) U.S. singer and big-band leader. He fronted his first group in 1928; it became the house band at Harlem's Cotton Club in 1931. An accomplished scat singer who combined audacious showmanship with prodigious vocal range and imagination, he became most identified with his hit "Minnie the Moocher" (193 1). Exposure with his band launched the careers of many important jazz

soloists. The composer George Gershwin modeled the character Sportin'

Life in his musical Porgy and Bess (1935) on Calloway, who later performed the role himself.

callus In botany, soft tissue that forms over a wounded or cut plant surface, leading to healing. A callus arises from cells of the cambium.

When a callus forms, some of its cells may organize into growing points, some of which in turn give rise to roots while others produce stems and leaves. Thus a callus may be capable of regenerating an entire plant.

Calmette \kal-'met\, Albert (Leon Charles) (b. July 12, 1863,

Nice, Fr. — d. Oct. 29, 1933, Paris)

French bacteriologist. In the 1 890s he founded the Pasteur bacteriological institutes in Saigon and later Lille. He discovered in 1908 that tuberculosis bacteria from cattle were weakened when cultured with bile, producing a strain of bacteria that provoked a protective immune reaction without causing disease. That discovery led him to develop, with Camille Guerin, a tuberculosis vaccine. He also described a test (Calmette reaction) for tuberculosis and discovered an antivenin for snakebite.

Calonne \ka-'lon\, Charles-
Alexandre de (b. Jan. 20, 1734,

Douai, France — d. Oct. 29, 1802,

Paris) French politician. He served as intendant of Metz (1768) and Lille (1774), and his financial genius led to his appointment as controller general of finance (1783). He soon discovered that major reforms were necessary to save France from bankruptcy. His efforts precipitated the governmental crisis that led to the French Revolution. After the Revolution began, he devoted himself to the cause of counterrevolution from his exile in England.

calorie Unit of energy or heat. Various precise definitions are used for different purposes (physical chemistry measurements, engineering steam tables, and thermochemistry), but in all cases the calorie is about 4.2 joules, the amount of heat needed to raise the temperature of 1 g of water by 1 °C (1.8 °F) at normal atmospheric pressure. The calorie used by dietitians and food scientists and found on food labels is actually the kilocalorie (also called Calorie and abbreviated kcal or Cal), or 1,000 calories. It is a measure of the amount of heat energy or metabolic energy contained in the chemical bonds (see bonding) of a food.

calorimeter V.ka-b-'ri-mo-torX Device for measuring heat produced during a mechanical, electrical, or chemical reaction and for calculating the heat capacity of materials. A common design, known as a bomb calorimeter, consists of a reaction chamber surrounded by a liquid that absorbs the heat produced by the reaction. The amount of heat can be determined from the increase in temperature, taking into account the properties of the container and the liquid.

Caltech See California Institute of Technology

Calukya \'ka-bk-yo\ dynasty or Chalukya dynasty Either of two ancient Indian dynasties. The Western Calukyas ruled as emperors in the Deccan (peninsular India) from ad 543 to 757 and again from c. 975 to c. 1189. The Eastern Calukyas ruled in Vengi (present-day eastern Andhra Pradesh) from c. 624 to c. 1070. The most significant ruling family of the Deccan in the 5th and 6th centuries, they controlled both coasts and the major river valleys.

Cab Calloway.

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Calmette

HARUNGUE-H. ROGER-VIOLLET

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calumet Vkal-ys-.metA or sacred pipe or peace pipe One of the

central ceremonial objects of many American Indian groups. It was considered a microcosm, its parts and its decorative colours and motifs corresponding to the essential parts of the universe. It was smoked in personal prayer as well as at collective rites. Because of the narcotic effect of the tobacco and the symbolism of the indrawn and ascending smoke, the calumet was employed as a means of communication between the spirit world and humans.

Calvary or Golgotha Hill in Jerusalem. The purported site of Jesus' Crucifixion, the hill was outside the Old City walls of Jerusalem and near the sepulchre where Jesus was said to have been afterward interred. Its exact location is uncertain, but most scholars prefer either the spot now covered by the Church of the Holy Sepulchre or a hillock called Gordon’s Calvary north of the Damascus Gate.

Calvert, George See George Calvert, 1st Baron Baltimore

Calvert, Leonard (b. c. 1606, England — d. June 9, 1647, St. Mary’s, Md.) First governor of the Maryland colony. He was the younger brother of Cecil Calvert, the colony’s proprietor. In 1633 he was sent from England to establish a settlement at St. Mary’s. He gradually allowed limited legislative initiative in the colony’s assembly. He lost a land conflict with William Claiborne and was forced to leave Maryland (1 644 — 46); aided by colonists, including Margaret Brent, he returned to reinstate his proprietorial rule.

Calvin, John French Jean Cauvin \ko-'va n \ (b. July 10, 1509, Noyon, Picardy, France — d. May 27, 1564, Geneva, Switz.) French Protestant theologian and major figure of the Reformation. He studied religion at the University of Paris and law in Orleans and Bourges. When he returned to Paris in 1531 he studied the Bible and became part of a movement that emphasized salvation by grace rather than by works. Government intolerance prompted him to move to Basel, Switz., where he wrote the first edition of Institutes of the Christian Religion (1536). Gaining a reputation among Protestant leaders, he went to Geneva to help establish Protestantism in that city. He was expelled by city fathers in 1538 but returned in 1541, when the town council instituted the church order outlined in his Ecclesiastical Ordinances, including enforcement of sexual morality and abolition of Catholic “superstition.” He approved the arrest and conviction for heresy of Michael Servetus. By 1555 Calvin had succeeded in establishing a theocracy in Geneva, where he served as pastor and head of the Genevan Academy and wrote the sermons, biblical com-

mentaries, and letters that form the basis of Calvinism.

Calvin, Melvin (b. April 8, 1911, St. Paul, Minn., U.S. — d. Jan. 8, 1997, Berkeley, Calif.) U.S. biochemist. He received his Ph.D. from the University of Minnesota. He developed a system of using the radioactive isotope carbon- 14 as a tracer element in his studies of the green alga chlorella. By halting the plant's metabolism at various stages and measuring tiny amounts of radioactive compounds present, Calvin was able to identify most of the reactions involved in the intermediate steps of photosynthesis, for which he was awarded a 1961 Nobel Prize. His research also included work in radiation chemistry and the processes leading to the origin of life.

Calvinism In Protestantism, the theology developed and advanced by John Calvin. It was further developed by his followers and became the foundation of the Reformed church and Presbyterianism. As shaped by Calvin's successor at Geneva, Theodore Beza (1519-1605), Calvinism emphasizes the doctrine of predestination, holding that God extends grace and grants salvation only to the chosen, or elect. It stresses the literal truth of the Bible, and it views the church as a Christian community in which Christ is head and all members are equal under him. It therefore rejects the episcopal form of church government in favor of an organization in which church officers are elected. Calvinism was the basis of theocracies in Geneva and Puritan New England (see Puritanism), and it strongly influenced the Presbyterian church in Scotland.

Calvino \kal-'ve-no\, Italo (b. Oct. 15, 1923, Santiago de las Vegas, Cuba — d. Sept. 19, 1985, Siena, Italy) Cuban-born Italian writer. After early works inspired by his involvement with the Italian Resistance in World War II, he turned decisively to fantasy and allegory in the 1950s. Cosmicomics (1965) is a collection of whimsical narratives about the creation and evolution of the universe. The novels Invisible Cities (1972), The Castle of Crossed Destinies (1973), and If on a Winter's Night a Traveler (1979) use playfully innovative structures and shifting viewpoints. The Uses of Literature (1980) is a collection of essays he wrote for a left-wing journal he edited from 1959 to 1966.

calypso \k3-'lip-so\ Musical style best known as a type of folk song. Calypso originated in Trinidad but is common throughout the Caribbean. The calypso tradition dates to the early 19th century. The subject of a calypso text, usually witty and satiric, is an event of political or social import. The lyric often incorporates Spanish, Creole, and African phrases, employing newly invented expressions such as bobol (graft) and pakoti (unfaithfulness). The exaggeration of local speech patterns is matched by an offbeat rhythm. Favourite accompanying instruments are the shak-shak (maraca), cuatro (a string instrument), and tamboo-bamboo (bamboo poles of various lengths struck on the ground). Shaped and tuned oil drums, played together in orchestras called steel bands, have also been popular.

cam Machine component that either rotates or reciprocates (moves back and forth) to create a prescribed motion in a contacting element (the follower). Since the shape of the contacting surface of the cam is determined by the prescribed motion and the profile of the follower, cams take various forms. Cam-follower mechanisms are particularly useful when a simple motion of one part of a machine is to be converted to a more complicated prescribed motion of another part, one that must be accurately

timed with respect to the simple motion and may include periods of rest (dwells). Cams are essential elements in automatic machine tools, printing machines, sewing machines, and textile machinery.

Cam Ranh Vkam-'ranV Bay Vietnamese Vinh Cam Ranh Inlet of the South China Sea, south-central Vietnam. Located between Phan Rang and Nha Trang, it was a French colonial naval base. It was used by the Japanese in World War II. From 1965 it was a major U.S. base in the Vietnam War. It later was a major Soviet naval base, and Russia maintained a presence there after the dissolution of the U.S.S.R.

Camaguey \,ka-ma-'gwa\ City (pop., 1994 est.: 293,961), capital of Camagiiey province, Cuba. Founded at the site of the present-day port of Nuevitas, it was moved inland in 1528. Because of the province's great production of livestock and agricultural products, it is now Cuba's largest interior city and an important communications, trading, and industrial centre.

Camargo \ka-mar-'go\, Marie (-Anne de Cupis de) (b. April 15, 1710, Brussels, Spanish Netherlands — d. April 20, 1770, Paris, Fr.) French ballerina. She made her Paris Opera debut in 1726 and went on to dance in 78 ballets and operas before her retirement in 1751. Admired for her speed and agility, she executed jumping steps previously performed only by male dancers, shortening her skirts and removing the heels from her slippers to enable her do so. Her name was adopted in 1930 by a British ballet group, the Camargo Society.

Camargue \ka-'marg\ Marshy island in the delta of the Rhone River, southern France. Occupying an area of 300 sq mi (780 sq km), it is sparsely populated). The region was once entirely wild, with free-roaming herds of cattle and wild horses; such herds can still be found in the regional park. Vineyards, forage crops, and grains were planted beginning in the late 19th century; rice growing developed after 1945. A nature reserve at the Vaccares Lagoon protects waterbirds such as flamingos and egrets.

Cambay, Gulf of See Gulf of Khambhat
Cambio, Arnolfo di See Arnolfo di Cambio

cambium In plants, a layer of actively dividing cells between xylem (fluid-conducting) and phloem (food-conducting) tissues that is responsible for the secondary growth of stems and roots, resulting in an increase in thickness. A cambium may also form within callus tissues. See also bark, wood.

Cambodia officially Kingdom of Cambodia Country, Southeast Asia. Area: 69,898 sq mi (181,035 sq km). Population (2005 est.): 13,327,000. Capital: Phnom Penh. The vast majority of the population belongs to the Khmer ethnic group. Language: Khmer (official). Religions: Buddhism (official); also traditional beliefs. Currency: riel. The landscape is dominated by large central plains; the Dangrek Mountains rise along the northern border. Cambodia lies largely in the basin of the Mekong River; the large lake Tonle Sap is in its western part. Much of the country is tropical forest. It is one of the world's poorest countries. Agriculture employs about three-fourths of the workforce. Cambodia is a constitutional monarchy with two legislative houses; its chief of state is the

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king, and its head of government is the prime minister. In the early centuries ad the area was under Hindu and, to a lesser extent, Buddhist influence. The Khmer state gradually spread in the early 8th century

and reached its height under Jayavarman II and his successors in the 9th-12th centuries, when it ruled the Mekong valley and neighbouring states and built Angkor. Buddhism was widely adopted in the 13th century. From the 13th century the state was attacked by Annam and Tai (Siamese) city-states and was subject largely to Tai and Vietnamese hegemony. It became a French protectorate in 1863. It was occupied by the Japanese in World War II and became independent in 1954. Its borders were the scene of fighting in the Vietnam War from 1961, and in 1970 its north-eastern and eastern areas were occupied by the North Vietnamese and penetrated by U.S. and South Vietnamese forces. A bombing campaign in Cambodia by U.S. warplanes alienated much of the population, enabling the communist Khmer Rouge under Pol Pot to seize power in 1975. Their regime of terror resulted in the deaths of at least 1.5 million Cambodians. Vietnam invaded in 1978 and drove the Khmer Rouge into the western hinterlands, but Cambodian infighting continued. A peace accord was reached by most Cambodian factions under UN auspices in 1991. Elections were held in 1993, and Norodom Sihanouk was restored to the monarchy. A civilian government slowly emerged under UN tutelage until 1997, when a coup by Hun Sen consolidated his position as prime minister. Hun Sen’s party won legislative elections in 1998; also that year, Cambodia became part of ASEAN.

Cambodian See Khmer

Cambodian language See Khmer language

Cambon \ka n -'bo n \ / (Pierre-) Paul (b. Jan. 20, 1843, Paris, France — d. May 29, 1924, Paris) French diplomat. He worked in the civil service (1870-82) before entering the diplomatic service, in which he served as ambassador to Spain and Turkey. Appointed ambassador to Britain (1898-1920), he spent his first years in smoothing over Anglo-French relations. His efforts were crowned by the signing of the Entente Cordiale in 1904. During World War I he continued to play a vital role in cooperation between the two allies.

Cambrai \kam-'bra\. League of (1508-10) Alliance of Pope Julius II, Emperor Maximilian I, King Louis XII, and King Ferdinand V, formed in 1508. Ostensibly directed against the Turks, its actual aim was to attack the Republic of Venice and divide its possessions among the allies. The allies were unable to act together because of their individual ambitions, and the league collapsed in 1510, when the pope joined with Venice, while Ferdinand became neutral.

Cambrai \kam-'bra\, Treaty of or Paix des Dames Vpe-da-'damX (French: “Peace of the Ladies”) (August 3, 1529) Agreement ending one phase of the wars between Francis I of France and Emperor Charles V, temporarily confirming Spanish (Habsburg) control in Italy. It was called the Paix des Dames because it was negotiated by Louise of Savoy (1476-1531), mother of King Francis and regent in his absence, and Margaret of Austria, aunt of Charles and regent of the Netherlands. See also Treaty of Cateau-Cambresis.

Cambrian Period Oldest time division of the Paleozoic Era. During the Cambrian, 543^190 million years ago, there were widespread seas and several scattered landmasses. The largest continent was Gondwana. The average climate was probably warmer than today, with less variation between regions. There were no land plants or animals, but there were marine organisms with either shells or skeletons. Because the dominant animals were trilobites, the Cambrian is sometimes referred to as the Age of Trilobites.

Cambridge City and administrative district (pop., 2001: 108,878), eastern England. It is the county seat of Cambridgeshire. Cambridge lies on the River Cam, a tributary of the Ouse, north of London. Originally a fording site, Cambridge possesses earthworks and Roman remains. Two monastic foundations date from the 11th- 12th centuries. Cambridge received its first charter in 1207. It is best known as the site of the University of Cambridge, noted for its educational excellence and outstanding architecture. The city’s economy is linked to the university and its research and development services.

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Corpus Christi College, University of Cambridge, Cambridge.

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Cambridge City (pop., 2000: 101,355), northeastern Massachusetts, U.S. Adjacent to Boston, it was founded in 1630 as one of the Massachusetts Bay Colony settlements. The first American institution of higher learning. Harvard College (see Harvard University), was founded here in 1636. George Washington took command of the Continental Forces at what is now Cambridge Common in 1775. In the 19th century it was the home of such literary leaders as Henry Wadsworth Longfellow, James Russell Lowell, and Oliver Wendell Holmes. The Massachusetts Institute of Technology moved to Cambridge from Boston in 1916.

Cambridge, University of Autonomous institution of higher learning in Cambridge, Cambridgeshire, England. Its beginnings lie in an exodus of scholars from the University of Oxford in 1209. Its first college was built in 1284, and the university was officially recognized by the pope in 1318. From 1511 Desiderius Erasmus did much to inculcate the new learning of the Renaissance at Cambridge. In 1546 Henry VIII founded Trinity College, which remains the largest of Cambridge’s 31 colleges. From 1669 Isaac Newton taught mathematics, giving this field a unique

position there. In 1871 James Clerk Maxwell accepted the chair of experimental physics, beginning a leadership in physics that would continue into the next century. A host of world-renowned scholars in other fields have also taught at Cambridge, including John Maynard Keynes in economics and Stephen W. Hawking in applied mathematics and theoretical physics. Many of the university's buildings, including the famous King's College Chapel and two chapels designed by Christopher Wren, are rich in history and tradition. The library houses numerous important collections, and the Fitzwilliam Museum contains noteworthy collections of antiquities.

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Cambridge Agreement Pledge made in Cambridge, England, in

1629 by Puritan stockholders of the Massachusetts Bay Co. to emigrate to New England if the colony's government could be transferred there. The company agreed and shifted control of the corporation to the signers of the agreement. John Winthrop was elected governor, and he set sail in

1630 with a large group of Puritan followers to settle in the Boston area (see Massachusetts Bay Colony).

Cambridge Platonists Vpla-t 3 n-ists\ Group of 17th-century British philosophic and religious thinkers. Led by Benjamin Whichcote (1609-1683), it included Ralph Cudworth and Henry More (1614-1687) at Cambridge and Joseph Glanvill (1636-1680) at Oxford. Educated as Puritans, they reacted against the Calvinist emphasis on the arbitrariness of divine sovereignty. In their eyes, Thomas Hobbes and the Calvinists erred in making the voluntarist assumption (see voluntarism) that morality consists in obeying the will of a sovereign. Morality, they asserted, is essentially rational, and the good person's virtue is grounded in an understanding of the eternal and immutable nature of goodness, which not even God can alter through sovereign power.

Cambridgeshire Vkam-brij-.shhA Administrative (pop., 2001: 552,655), geographic, and historic county, eastern England. Greatly enlarged in the government reorganization in 1974, Cambridgeshire now includes part of the former county of Huntingdonshire and the Isle of Ely; the county seat is Cambridge. Prehistoric tracks ring the fens; drainage was begun by the Romans. Major structures include Ely Cathedral and the buildings of the University of Cambridge. Cambridgeshire is crossed by two major rivers, the Nen and the Ouse, with its tributary the Cam.

Camden Town Group Group of English painters formed in 1911. The artists met weekly in the studio of Walter Sickert (1860-1942), the group's prime inspiration, in a working-class area of London. The Camden Town artists utilized an Impressionist technique but were also open to the influence of Post- Impressionism. Their subject matter was derived from the

everyday life of an English industrial town. Despite a somewhat expressive use of colour, their paintings remained representational and realistic, reflecting an interpretation of a modem aesthetic different from the more formally daring developments emerging in Paris at the same time. The Camden Town Group was absorbed in 1913 by the London Group, a combination of several smaller groups of contemporary English artists.

camel Either of two species of large, hump-backed ruminants of the family Camelidae. Camels are used as draft and saddle animals in desert regions of Africa, Arabia, and Asia.

Adaptations to windblown deserts include double rows of eyelashes, the ability to close the nostrils, and wide-spreading soft feet. They also can tolerate dehydration and high body temperatures. They are thus able to go several days without drinking water. Though docile when properly trained, camels can be dangerous. The Bactrian camel (Came - lus bactrianus) is about 7 ft (2 m) tall at the top of the two humps; the Arabian camel (C. dromedarius), or dromedary, has one hump and is 7 ft (2 m) high at the shoulder. When food is available, camels store fat in their humps to be used later for sustenance; water is produced as a by-product of fat metabolism. The feral camels of Australia were introduced to that continent in the 1800s.

camel racing Sport of running camels at speed, with a rider astride, over a predetermined course. The sport is generally limited to running the dromedary — whose name is derived from the Greek verb dramein, “to run” — rather than the Bactrian camel. Camel racing on the Arabian Peninsula can be traced to at least the 7th century. Although traditionally overshadowed by horse racing in that region, the racing of camels was long a folk sport practiced at social gatherings and festivals. In the late 20th century it was organized into a formal sport, similar to Thoroughbred horse racing. The sport is popular in India, Australia, parts of East Africa, and especially the Arab countries of the Middle East. A race typically has 25 to 30 entries and covers distances ranging from 2.5 to 6 mi (4 to 10 km).

camellia Nko-'mel-yoV Any of the East Asian evergreen shrubs and trees that make up the genus Camellia in the tea family (Theaceae), most notable for three ornamental flowering species and for C. sinensis (sometimes called Thea sinensis), the source of tea. The common camellia (C. japonica) is the best-known, particularly for its double (many-petaled) cultivated varieties. The tea plant (C. sinensis), reaching 30 ft (9 m) in the wild but in cultivation kept to a low, mounded shrub, bears fragrant white, yellow-centred flowers.

Camelot In Arthurian legend, the seat of King Arthur’s court. It has been variously identified with Caerleon in Wales, Queen Camel in Somerset, Camelford in Cornwall, Winchester in Hampshire, and Cadbury Castle in Somerset. Camelot has come to symbolize a short-lived golden era under

a beloved leader.

cameo Hard or precious stone, glass, ceramic, or shell carved in relief above the surface. It is the opposite of intaglio. Surviving cameos date from the early Sumerian period (c. 3100 bc) to the decline of Roman civilization, and from the Renaissance to the Neoclassical period of the 18th century. They were carved with mythological scenes and portraits, and many commemorated specific persons. In the 1 8th– 19th century, cameos adorned diadems, belts, brooches, and bracelets.

cameo glass Glassware decorated with figures and forms in coloured glass carved in relief against a glass background of a contrasting colour. It is produced by blowing two layers of glass together. When the glass has cooled, an outline of the design is drawn on the surface and covered with wax. The glass is then etched down to the inner layer, leaving the design outline in relief. Fine cameo glass was produced by the Romans in the 1st century ad. The art was revived by John Northwood in England and Emile Galle in France in the late 19th century.

camera Device for recording an image of an object on a light-sensitive surface (see photography). It is essentially a light-tight box with an opening (aperture) to admit light focused onto a sensitized film or plate. All cameras have included five crucial components: (1) the camera box, which holds and protects the sensitive film from all light except that entering through the lens; (2) film, on which the image is recorded; (3) the light control, consisting of an aperture or diaphragm and a shutter, both often adjustable; (4) the lens, which focuses the light rays from the subject onto the film, creating the image; and (5) the viewing system, which may be separate from the lens system (usually above it) or may operate through it by means of a mirror. The camera was inspired by the camera obscura — a dark enclosure with an aperture (usually provided with a lens) through which light enters to form an image of outside objects on the opposite surface — and was developed by Nicephore Niepce and L.-J.-M. Daguerre in the early 19th century. See also digital camera.

Camerarius \,kam-3-'rar-e-3s\, Rudolph (Jacob) German Rudolph Camerer (b. Feb. 17, 1665, Tubingen, Ger. — d. Sept. 11, 1721, Tubingen) German botanist. One of the first to perform experiments in heredity, he demonstrated sexuality in plants by identifying and defining the male and female reproductive parts of the plant and by describing their function in fertilization, showing that pollen is required for the process.

Cameron, Julia Margaret (b. June 11, 1815, Calcutta, India — d. Jan. 26, 1879, Kalutara, Ceylon) British portrait photographer. In 1864, after receiving a camera as a gift, she set up a studio and darkroom and

began taking portraits. Her sitters were friends such as Alfred Tennyson, Henry Wadsworth Longfellow, and Charles Darwin. Her sensitive portraits of women, such as that of Ellen Terry, are especially noteworthy. Like many Victorian photographers, she made allegorical photographs in imitation of the Pre-Raphaelite paintings of the day. Her technical ability was criticized, but she was more interested in spiritual depth than in technical perfection; her portraits are considered exceptionally fine.

Bactrian camel (Camelus bactrianus)

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"The Rape of Europa," cameo in gold and enamel frame, 1 6th– 1 7th century; in the Kunsthistorisches Museum, Vienna

COURTESY OF THE KUNSTHISTORISCHES MUSEUM, VIENNA

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Cameron, Simon (b. March 8, 1799, Maytown, Pa., U.S. – d. June 26, 1889, Donegal Springs, Pa.) U.S. politician. He was successful in several businesses before entering the U.S. Senate (1845-49, 1857-61, and 1867-77). As leader of Pennsylvania's Republican Party, he helped secure the nomination of Abraham Lincoln in 1860. Appointed secretary of war in 1861, he was soon dismissed for showing favouritism in awarding army contracts.

Cameroon officially Republic of Cameroon Country, West Africa. Area: 183,569 sq mi (475,442 sq km). Population (2005 est.): 16,988,000. Capital: Yaounde. The country has numerous ethnic groups, including the Fang (one-fifth of the population), Bamileke (one-fifth), Duala, and Fulani. Pygmies (locally known as Baguielli and Babinga) live in the southern forests. Languages: French, English (both official),

Fula, Bamileke, Duala. Religions: Christianity (mostly Roman Catholic; also Protestant), traditional beliefs, Islam (mainly in the north). Currency: CFA franc. Cameroon has four geographic regions. The southern area consists of coastal plains and a densely forested plateau. The central region rises progressively to the north and includes the Adamawa Plateau. In the north a savanna plain slopes downward toward the Lake Chad basin. To the west and north along the Nigerian border the relief is mountainous and includes Mount Cameroon. Of the main rivers, the Sanaga drains into the Atlantic Ocean, and the Benue flows westward into the Niger River basin in Nigeria. Cameroon has a developing market economy based largely on agriculture but with a growing services sector. It is a republic with one legislative house; its chief of state is the president and its head of government the prime minister. Long inhabited before European colonization, Cameroon was peopled by Bantu- language speakers coming from equatorial Africa to settle in the south. They were followed by Muslim Fulani from the Niger River basin, who settled in the north. Portuguese explorers visited in the late 15th century, and the Dutch were also active there. In 1884 the Germans took control and extended their protectorate over Cameroon. In World War I joint French-British action forced the Germans to retreat, and after the war the region was divided into French and British administrative zones. After World War II the two areas became UN trusteeships. In 1960 the French trust territory became an independent republic. In 1961 the southern part of the British trust territory voted for union with the new Republic of Cameroon, and the northern part voted for union with Nigeria. The independent country has faced chronic economic problems, which have produced unrest in the country.

Cameroon, Mount Volcanic massif, Cameroon. Rising to 13,435 ft (4,095 m), it is the highest peak in West Africa. Extending 14 mi (23 km) inland from the Gulf of Guinea, it is the westernmost extension of a series

of mountains that form a natural boundary between Cameroon and Nigeria. Richard Burton climbed its summit in 1861. The volcano last erupted in 2000.

Camilla In Roman mythology, a legendary warrior maiden and favourite of Diana. According to Virgil, her father dedicated her to Diana and trained her as a hunter and warrior, and she led a band of warriors that included women. She fought against Aeneas and was killed as she chased a retreating soldier.

Camillus \k3-'mil-3s\, Marcus Furius (d. 365 bc) Roman soldier and statesman. He allegedly defeated the Gauls after their sack of Rome (c. 390), for which he was honoured as the city’s second founder. Awarded four triumphs and made dictator five times, he enjoyed his greatest victory in 396, over the Etruscans at Veii. Though a patrician, he adopted reforms beneficial to the army and the plebeians (367).

Camisards \'kam-o-,zardz\ Protestant militants in southern France who opposed Louis XIV’ s persecution of Protestantism. The armed insurrection, which began in 1702, came in response to Louis’s revocation of the Edict of Nantes, ending religious toleration. The well-organized Camisards, so named for their white shirts (in French dialect, camisa), fought successfully and even held royal armies in check. In response, the government burned hundreds of villages and massacred their populations. By 1705, with many of the Camisard leaders captured and executed, the revolt had lost its force.

Camoes \k3-'m6i n sh\, Luis (Vaz) de (b. c. 1524/25, Lisbon — d. June 10, 1580, Lisbon) Portuguese poet. A member of the impoverished aristocracy, he may have spent about 17 years in India. His masterpiece, the epic The Lusiads (1572), extols glorious deeds in Portuguese history as it recounts Vasco da Gama's discovery of the sea route to India. His numerous lyric pieces (together with many apocryphal poems) appeared posthumously in editions of the poetry collection Rimas (from 1595). He also wrote dramatic works, including Filodemo (1587), in which he developed the auto , a kind of morality play, and the comedy The Two Amphitryons (1587). He had an unparalleled impact on Portuguese and Brazilian literature and is regarded as Portugal's national poet.

camouflage Vka-mo-.flazhX Art and practice of concealment and visual deception in war. Its goal is to prevent enemy observation of installations, personnel, equipment, and activities. Camouflage came into wide use in World War I in response to air warfare. Aerial reconnaissance (and later aerial bombardment) required concealment of troops and equipment. By World War II, long-range bombing threatened warring countries in their entirety, and almost everything of military significance was hidden to some degree, using mottled, dull-coloured paint patterns (green, gray, or brown), cloth garnishing, netting, and natural foliage. Dummies and decoys, including fake vehicles and airfields, tricked enemy planes into bombing harmless targets. It remained an important technique after World War II, used with notable success by communist guerrilla units in the Vietnam War.

Camp David Rural retreat of U.S. presidents, northern Maryland. The scenic mountainous area (200 acres, or 81 hectares) was established as "Shangri-La" in 1942 by Pres. Franklin Roosevelt and made an official presidential retreat by Harry Truman in 1945. In 1953 Dwight D. Eisenhower renamed it Camp David for his grandson. It has been the scene of a number of high-level presidential conferences with foreign heads of state. See also Camp David Accords.

Camp David Accords (1978) Two agreements reached between Menachem Begin of Israel and Anwar el- Sadat of Egypt with the help of U.S. President Jimmy Carter at Camp David, Md., U.S. One agreement created a framework for negotiations to arrive at a peace treaty between Egypt and Israel, formally ending some 30 years of being in a state of war. This treaty, normalizing relations, was signed in 1979 and led to the return of the Sinai Peninsula, occupied by Israel in the Six-Day War (1967), to Egypt. The other agreement created a framework for a broader peace in the region that included a plan for Palestinian self-rule in the West Bank and Gaza Strip. The latter provisions were not implemented. See also Moshe Dayan.

Campania \kam-'pa-nya\ Region (pop., 2001 prelim.: 5,652,492), southern Italy. It is located on the Tyrrhenian Sea and occupies 5,249 sq mi (13,595 sq km). Its capital is Naples. Occupied successively by Greeks, Etruscans, and Samnites, Campania became an ally of Rome c. 350 bc. It was a favourite resort of the Romans, and it is noted for its natural beauty and famous old towns, including Cumae, Pompeii, Capua, Salemum, and

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Neapolis (Naples). After the fall of Rome, Campania was ruled by Gaul, Byzantium, and the Normans; it became part of the Kingdom of Naples in 1282. It was united with Italy in 1861. Its economy is bolstered by agriculture, the industrial area around Naples, and tourism.

campanile \,kam-p3-'ne-le\ Italian belltower, originally built beside or attached to a church. The earliest campaniles (7th-10th century) were plain round towers with a few small arched openings near the top; the Leaning Tower of Pisa is an elaborate version of this type. The Venetian form of campanile consisted of a tall, square, slim shaft, frequently tapered, with a belfry at the top, above which rose the spire, sometimes square as in the famous campanile of St. Mark's Basilica (1 Oth— 1 2th century, belfry story 1510). After falling out of favor during the Renaissance, the Venetian type was revived in the 19th century, often in connection with factories, housing, or collegiate buildings.

campanula See bellflower

Campbell, John Archibald (b. June 24, 1811, Washington, Ga., U.S. — d. March 12, 1889, Baltimore, Md.) U.S. jurist. After being admitted to the bar at age 18, he moved to Alabama, where he gained a large private practice and served in the state legislature. Appointed to the Supreme Court of the United States in 1853, he became known as a strict constructionist; his tenure was notable for his concurrence in the Dred Scott decision. Although he opposed secession as imprudent, he resigned from the Supreme Court in 1861 and cast his lot with the South in the American Civil War, serving as assistant secretary of war for the Confederacy. After the South’s surrender he was imprisoned for four months on false charges. Upon his release he moved to New Orleans, where he established a law practice.

Campbell, Joseph (b. March 26, 1904, New York, N.Y., U.S. — d. Oct. 31, 1987, Honolulu, Hawaii) U.S. author of works on comparative mythology. He studied English literature and taught at Sarah Lawrence College. He explored the common functions of myths in human cultures, examining mythic archetypes in folklore and literature from around the world. His views, strongly influenced by Carl Gustav Jung, were popularized through a public-television series in the 1980s. His books include The Hero with a Thousand Faces (1949) and The Masks of God (4 vol., 1959-67).

Campbell, Kim orig. Avril Phaedra Campbell (b. March 10, 1947, Port Alberni, B.C., Can.) Prime minister of Canada (1993). She taught political science at the University of British Columbia and practiced law for two years before turning to politics. In 1988 she was elected to the federal parliament as a Progressive Conservative. Under Prime Minister Brian Mulroney, she became minister for Indian affairs (1989), attorney general (1990), and defense minister (1993). Upon Mulroney’ s retirement in June 1993, she became Canada’s first female prime minister and the first prime minister from the West Coast. Her tenure was brief; in November her party suffered a heavy defeat, and she resigned as party leader.

Campbell, Mrs. Patrick orig. Beatrice Stella Tanner (b. Feb. 9, 1865, London, Eng. — d. April 9, 1940, Pau, France) British actress. She married at age 19 and made her stage debut in 1888, winning fame as Paula in The Second Mrs. Tanqueray in 1893. She originated the role of Eliza Doolittle in George Bernard Shaw's Pygmalion (1914), and she and Shaw conducted a famous correspondence for many years. She also achieved great success in Maurice Maeterlinck's Pelleas and Melisande, Henrik Ibsen's Ghosts, and Sophocles' Electra. She made her film debut in Riptide (1933) at age 68 and later appeared in several more films.

Campbell family Vkam-bolV or Campbells of Argyll \ar-'gil\ Scottish noble family. The Campbells of Lochow gained prominence in the later Middle Ages. In 1457 Colin Campbell, Baron Campbell (died 1493), was created 1st earl of Argyll. Archibald (died 1558), 4th earl, was a leading Protestant. Archibald (15327-1573), 5th earl, was also a Protestant but supported the Catholic Mary, Queen of Scots. Archibald (16077-1661), 8th earl, was the leader of Scotland's anti-Royalist party in the English Civil Wars. His son Archibald (1629-1685), 9th earl, was a Protestant leader executed for his opposition to the Roman Catholic king James II. Archibald (16517-1703), 10th earl, regained the family estates and was created 1st duke of Argyll; he organized the massacre of the Macdonalds of Glencoe. John Campbell (1678-1743), 2nd duke, supported union with England and was commander of the British forces in the Jacobite rebellion of 1715. Archibald (1682-1761), 3rd duke, was a prominent politician during the early Hanoverian period in Britain. After he died without a legitimate heir, the succession passed to the Campbells of Mamore.

Campbell-Bannerman, Sir Henry orig. Henry Campbell (b. Sept. 7, 1836, Glasgow, Scot. — d. April 22, 1908, London, Eng.) British politician. A member of the House of Commons from 1 868, he was elected leader of the Liberal Party in 1899 and served as prime minister (1905-OS). His popularity unified his badly divided party. Though much of his legislative program was nullified by the House of Lords, he obtained approval of the Trades Disputes Act of 1906. He took the lead in granting self-government to the Transvaal and the Orange River Colony, thereby securing the Boers' loyalty to the British Empire.

Campeche \kam-'pa-cha\ State (pop., 2000: 690,689), southeastern Mexico. Covering 19,619 sq mi (50,812 sq km), its capital is Campeche. Located on the Yucatan Peninsula, it is bounded by the Gulf of Mexico. Named for the ancient Mayan province of Kimpech (Campech), it comprises much of the western part of the peninsula. Rivers in the southern part drain into Terminos Lagoon, at whose gulf entrance is the area's chief depot, Ciudad del Carmen. Forest products and commercial fishing are important to the economy.

Campeche City (pop., 2000: 190,813), capital of Campeche state, Mexico. The Spanish town was founded in 1540 on the site of a Mayan village, the remains of which are still visible. It became the capital of the newly created Campeche state in 1863. It is a service centre for offshore oil drilling facilities.

Campeche, Bay of Inlet of the Gulf of Mexico. Bounded by the

Yucatan Peninsula, the Isthmus of Tehuantepec, and the southern part of the state of Veracruz, it covers about 6,000 sq mi (15,500 sq km). Major offshore oil fields were developed in the bay in the 1970s, and it became Mexico's principal oil-producing region. In 1979 an accident at an oil well there released some 3 million barrels of crude oil into the gulf; the government spent more than $100 million to bring the spill under control.

camphor Organic compound of the isoprenoid family. A white, waxy solid with a penetrating, somewhat musty aroma, it is obtained from the wood of the camphor laurel (see laurel family), Cinnamomum camphora (found in Asia), or produced synthetically from oil of turpentine. It has long been used in incense and as a medicinal. Modem applications include use as a plasticizer for cellulose nitrate, as a moth repellent, as a flavouring, in embalming, and in fireworks. Camphorated oil is 20% camphor in olive oil.

Campin Vkam-pin\, Robert (b. c. 1378, Tournai, Fr. — d. April 26, 1444, Tournai) Flemish painter. He is identified with the Master of Flemalle on stylistic grounds. Documents show that Campin was a master painter in Tournai in 1406; two students are listed as entering his studio in 1427: Rogier van der Weyden and Jacques Daret. Campin' s principal surviving works are two large panels of an altarpiece once believed to have come from a nonexistent Abbey of Flemalle. The famous Merode Altarpiece, a triptych of the Annunciation formerly regarded as his masterpiece, is now thought to be by a member of his workshop or circle. Characterized by a naturalistic conception of form and a poetic representation of the objects of daily life, Campin' s work marks the break with the prevailing International Gothic style and prefigures the achievements of the painters of the Northern Renaissance. Despite much uncertainty about his life and work, he was one of the most important and influential Flemish artists of the 15th century.

camping Recreational activity in which participants live outdoors, often in the wilderness, usually using tents, trailers, or motor homes, but sometimes only a sleeping bag, for shelter. Modem camping originated near the end of the 19th century in the U.S. as a rough, back-to-nature pastime for hardy lovers of nature. Canoes were the original vehicle; bicycle camping soon followed. Camping was a major part of the programs of the Boy Scouts and Girl Guides (see scouting). It gained greatly in popularity after World War II. As the number of campgrounds with greater amenities grew, it became the standard holiday for many ordinary families. Recent decades have seen its continued growth, to the point of placing a serious strain on the resources of state and federal outdoor-recreation areas. See also backpacking.

campion Any of the ornamental rock-garden or border plants that make up the genus Silene, of the pink family, consisting of about 500 species of herbaceous plants found throughout the world. The name is also applied

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to members of the genus Lychnis of the same family. Some species of Silene stand erect; others are spreading plants. The stems often are covered with a sticky material. Some species have solitary flowers; others have branched clusters of red, white, or pink flowers. The fruit is a capsule.

Campion, Jane (b. April 30,

1954, Wellington, N.Z.) New Zealand film director. After training as a painter in Australia, she studied filmmaking and made several notable short films. Her first feature,

Sweetie (1989), was followed by the successful An Angel at My Table (1990). She wrote and directed the internationally acclaimed The Piano (1993) and directed The Portrait of a Lady (1996) and Holy Smoke (1999).

Campo Formio \,kam-p6-'f6r-me-o\. Treaty of (Oct. 17, 1797) Peace settlement between France and Austria, signed at Campo Formio (now Campoformido, Italy) following Austria's defeat in Napoleon's first Italian campaign. The treaty preserved most of the French conquests and completed Napoleon's victory over the First Coalition, the group of European nations opposing him. See also French Revolutionary Wars.

Campobasso \,kam-po-'ba-s6\ City (pop., 2001 prelim.: 46,860), Italy. Located northeast of Naples, it is the capital of Mouse autonomous region. The old hill town was abandoned in 1732 when its inhabitants built a new town on a lower fertile plain. The old town still has a medieval castle and Romanesque churches; the new town has an archaeological museum.

Campylobacter Vkam-pi-lo-.bak-taiA Genus of gram-negative spiral-shaped bacteria infecting mammals. Many species, especially C. fetus , cause miscarriage in sheep and cattle. C. jejuni is a common cause of food poisoning. Sources include meats (particularly chicken) and unpasteurized milk. Infection causes acute gastroenteritis, fever, headache, and joint and muscle pain; nerve damage and death may occur in severe cases.

Camus \ka-'nne\, Albert (b. Nov. 7, 1913, Mondovi, Alg. — d. Jan. 4, 1960, near Sens, France) Algerian-French novelist, essayist, and playwright. Born into a working-class family, Camus graduated from the university in Algiers and then worked with a theatrical company, becoming associated with leftist causes. He spent the war years in Paris, and the French Resistance brought him into the circle of Jean- Paul Sartre and existentialism. He became a leading literary figure with his enigmatic first novel, The Stranger (1942), a study of 20th-century alienation, and the philosophical essay "The Myth of Sisyphus" (1942), an analysis of contemporary nihilism and the concept of the absurd. The Plague (1947), his allegorical second novel, and "The Rebel" (1951), another long essay, developed related issues. Other major works include the short-story collection Exile and the Kingdom (1957) and the posthumous autobiographical novel The First Man (1994). His plays include Le Malentendu (1944) and Caligula (1944). Camus won the Nobel Prize for Literature in 1957.

He died in a car accident.

Canaan Vka-naM Ancient name for an area of shifting boundaries but centred on Palestine. Coastal Canaanite civilization dates to the Paleolithic Period; towns developed in Neolithic times (c. 7000-4000 bc). The name appears in writings from the 15th century bc. Invaded by the Hebrews (c. 1200 bc), who settled in southern areas, it was later invaded by the Philistines. In the 10th century bc the Israelites, under King David, broke Philistine power, and Canaan became thereafter the Land of Israel, the "Promised Land" of the biblical book of Exodus.

Canada Country, North America. Area: 3,855,103 sq mi (9,984,670 sq km). Population (2005 est.): 32,227,000. Capital: Ottawa. People of British and French descent constitute more than half the population; there are significant minorities of Chinese, South Asian, German, Italian, American Indian, and Inuit (Eskimo) origin. Languages: English, French (both official). Religions: Christianity (mostly Roman Catholic; also Protestant, other Christians, Eastern Orthodox); also Islam, Judaism, Hinduism, Buddhism. Currency: Canadian dollar. Canada may be divided into several physiographic regions. A large interior basin centred on Hudson Bay and covering nearly four-fifths of the country is composed of the Canadian

Shield, the interior plains, and the Great Lakes-St. Lawrence lowlands. Rimming the basin are highland regions, including the Arctic Archipelago. Mountain ranges include the Rocky, Coast, and Laurentian mountains. Canada's highest peak is Mount Logan (19,551 ft [5,959 m]) in Yukon Territory. Five of Canada's rivers — the St. Lawrence, Mackenzie, Yukon, Fraser, and Nelson — rank among the world's 40 longest. In addition to Lakes Superior and Huron, both shared with the U.S., Canada's Great Bear and Great Save lakes are among the world's 1 1 largest lakes in area. The country also includes several major islands, including Baffin, Ellesmere, Victoria, Newfoundand, and Melville, and many small ones. Its border with the U.S., the longest border in the world not patrolled by military forces, extends 5,525 mi (8,890 km). With a developed market economy that is export-directed and closely linked with that of the U.S., Canada is one of the world's most prosperous countries. It is a parliamentary state with two legislative houses; its chief of state is the British monarch, whose representative is Canada's governor-general, and the head of government is the prime minister. Originally inhabited by American Indians and Inuit, Canada was visited c. ad 1000 by Scandinavian explorers, whose settlement is confirmed by archaeological evidence from Newfoundland. Fishing expeditions off Newfoundland by the English, French, Spanish, and Portuguese began as early as 1500. The French claim to Canada was made in 1534 when Jacques Cartier entered the Gulf of St. Lawrence. A small settlement was made in Nova Scotia (Acadia) in 1604, and by 1608 Samuel de Champain had reached Quebec. Fur trading was the impetus behind the early colonizing efforts. In response to French activity, the English in 1670 formed the Hudson's Bay Company. The British-French rivalry for the interior of upper North America lasted almost a century. The first French loss occurred in 1713 at the conclusion of Queen Anne's War (War of the Spanish Succession), when Nova Scotia and Newfoundland were ceded to the British. The Seven Years' War (French and Indian War) resulted in France's expulsion from continental North America in 1763. After the American Revolution Canada's population was augmented by loyalists fleeing the United States, and the increasing number arriving in Quebec led the British to divide the colony into Upper and Lower Canada in 1791. The British reunited the two provinces in 1841. Canadian expansionism resulted in the

confederation movement of the mid- 19th century, and in 1867 the Dominion of Canada, comprising Nova Scotia, New Brunswick, Quebec, and Ontario, came into existence. After confederation, Canada entered a period of westward expansion. The prosperity that accompanied Canada into the 20th century was marred by continuing conflict between the English and French communities. Through the Statute of Westminster (1931), Canada was recognized as an equal partner of Great Britain. With the Canada Act of 1982, the British gave Canada total control over its constitution and severed the remaining legal connections between the two countries. French Canadian unrest continued to be a major concern, with a movement growing for Quebec separatism in the late 20th century. Referendums for more political autonomy for Quebec were rejected in 1992 and 1995, but the issue remained unresolved. In 1999 Canada formed the new territory of Nunavut. See map on following page.

Canadian Prime Ministers

John A. Macdonald

1867-73

W. L. Mackenzie King

1 935-48

Alexander Mackenzie

1873-78

Louis St. Laurent

1 948-57

John A. Macdonald

1878-91

John G. Diefenbaker

1 957-63

John Abbott

1891-92

Lester B. Pearson

1 963-68

John Thompson

1 892-94

Pierre Elliott Trudeau

1 968-79

Mackenzie Bowell

1894-96

Joseph Clark

1 979-80

Charles Tupper

1896

Pierre Elliott Trudeau

1 980-84

Wilfred Laurier

1896-1911

John N. Turner

1984

Robert Laird Borden

1911-20

Brian Mulroney

1 984-93

Arthur Meighen

1920-21

Kim Campbell

1993

W. L. Mackenzie King

1921-26

Jean Chretien

1 993-2003

Arthur Meighen

1926

Paul Martin

2003-06

W. L. Mackenzie King

1926-30

Stephen Harper

2006-

Richard Bedford Bennett

1930-35

Canada Act or Constitution Act Measure formally ending British power to legislate for Canada, approved by the British Parliament on March 25, 1982, and proclaimed by Queen Elizabeth II on April 17, 1982. The document contains the British North America Act and was approved by all the Canadian provinces except Quebec, which was denied its claim of a constitutional veto by Canada’s Supreme Court.

Bladder campion (Silene vulgaris).

JEWEL CRAIG— THE NATIONAL AUDUBON SOCIETY COLLECTION/PHOTO RESEARCHERS

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Ill

Canada Bill See Constitutional Act (1791)

Canada Company Organization instrumental in colonizing much of the western part of Upper Canada (now Ontario). The company was formed in 1824 to bring settlers to the region. It was directed until 1829 by John Galt (1779-1839), founder of Guelph and father of Alexander Galt. Though the company, chartered with 2.5 million acres, was criticized as a monopoly, it continued to exist until the 1950s.

Canada Day formerly Dominion Day Annual Canadian holiday. Observed on July 1, it commemorates the formation of the Dominion of

Canada on July 1, 1867. With the 1982 passage of the Canada Act, its name was officially changed to Canada Day. It is celebrated with parades, fireworks, flag display, and the singing of the national anthem, “O Canada.”

Canada East or Lower Canada Region of Canada now known as Quebec. In 1791-1841 it was known as Lower Canada and in 1841-67 as Canada East. Populated mainly by French settlers who wanted to preserve their distinctive identity and cultural traditions, it was reluctant to join the proposed confederation with Canada West. It finally agreed to confederation in 1867, providing that it would remain a territorial and governmental unit in which French Canadians would have an electoral majority.

Canada goose Brown-backed, light-breasted goose (Brcinta canadensis) with a black head and neck and white cheeks. Subspecies vary in size, from the 4.4-lb (2-kg) cackling goose to the 14.3-lb (6.5-kg) giant Canada goose, which has a wingspread of up to 6.6 ft (2 m). Canada geese breed across Canada and Alaska and winter mainly in the southern U.S. and Mexico; they have been introduced into England and other countries. They are an important game bird. Their almost incessant honking draws attention to their V-formations during migration. In recent years their population in North America has increased, making them pests in some inhabited areas.

Canada West or Upper Canada Region of Canada now known as Ontario. In 1791-1841 it was known as Upper Canada and in 1841-67 as Canada West. Settled primarily by English-speaking immigrants, it sought confederation with Canada East in order to secure the unified government needed for effective administration and the construction of intercolonial railways. The unified Dominion of Canada was made official by the British North America Act of 1867.

Canadian Alliance French Alliance Canadienne Former conservative Canadian political party. It was created in 2000 from the merger of the Reform Party of Canada with other conservative groups in an effort to mount a united challenge to the ruling Liberal Party of Canada. By 1997 the Reform Party, whose support had been concentrated in the western Canadian provinces, held 60 seats in the Canadian House of Commons and was the official opposition party. The new Canadian Alliance gained 66 seats in the 2000 election and became the official opposition, though it was unable to make significant inroads in eastern Canada. In 2003 the party merged with the Progressive Conservative Party to form the Conservative Party of Canada. The party’s platform generally favoured a reduction in the size of government, lower taxes, and conservative positions on social issues.

Canadian Broadcasting Corp. (CBC) Canadian public broadcasting service, created in 1936 to promote Canadian culture and serve as an instrument of national unity. It offers French- and English-language pro-

grams over AM and FM radio networks, television networks, cable television channels, and shortwave radio. Noted for its news and public affairs programs, the CBC also presents documentaries, dramas, classical music, entertainment, and educational programs as well as sports programs.

Canadian Football League (CFL) Major Canadian professional gridiron football organization, formed in 1958. The league's Western Conference includes teams from Edmonton, Calgary, British Columbia, Saskatchewan, and Winnipeg; its Eastern Conference comprises teams

from Hamilton, Montreal, Ottawa, and Toronto. The conference winners compete for the Grey Cup. The CFL plays a gridiron style of football.

Canadian Labour Congress (CLC) Nationwide association of labour unions in Canada. The CLC was formed in 1956 by the merger of the Canadian counterparts to the American Federation of Labor and the Congress of Industrial Organizations, which merged in the same year (see AFL-CIO). It represents roughly 3 million unionized workers across Canada.

Canadian National Railway Co. Corporation created by the Canadian government in 1918 to operate a number of nationalized railroads (including the old Grand Trunk lines. Intercolonial Railway, National Transcontinental Railway, and Canadian Northern Railway) as one of Canada's two transcontinental railroad systems. Its passenger services were taken over by VIA Rail Canada in 1978, and the company was privatized in 1995. The Canadian National Railway stretches across Canada from Nova Scotia to Vancouver. It bought the Illinois Central Corp. in 1999, thus acquiring a railroad network that links Canada to the Gulf of Mexico.

Canadian Pacific Railway Ltd. (CPR) Privately owned company that operates one of Canada's two transcontinental railroad systems. The company was created in 1881 to complete a railroad from Montreal to Port Moody in British Columbia. Its passenger services were taken over by VIA Rail Canada in 1978. After its former parent company, Canadian Pacific Ltd., reorganized in 2001, CPR became a publicly owned operator of freight rail lines across Canada and in parts of the U.S.

Canadian River River, southwestern U.S. Flowing across northeastern New Mexico, it cuts a gorge nearly 1 ,500 ft (450 m) deep before turning eastward to continue across northwestern Texas and through central Oklahoma to the Arkansas River in Oklahoma. It is 906 mi (1,458 km) long. Its course is punctuated by flood-control and irrigation units.

Canadian Shield One of the world's largest geologic continental shields, centred on Hudson Bay and extending for 3 million sq mi (8 million sq km) over Canada from the Great Lakes to the Canadian Arctic and into Greenland, with small extensions into northern Minnesota, Wisconsin, Michigan, and New York. It is the largest mass of exposed Precambrian rock on earth. The region as a whole is composed of ancient crystalline rocks whose complex structure attests to a long history of uplift and depression, mountain building, and erosion.

canal Artificial waterway built for transportation, irrigation, water supply, or drainage. The early Middle Eastern civilizations probably first built canals to supply drinking and irrigation water. The most ambitious navi-

gation canal was a 200-mi (320-km) construction in what is now Iraq. Roman canal systems for military transport extended throughout northern Europe and Britain. The most significant canal innovation was the pound lock, developed by the Dutch c. 1373. The closed chamber, or pound, of a lock is flooded or drained of water so that a vessel within it is raised or lowered in order to pass between bodies of water at different elevations. Canals were extremely important before the coming of the railroad in the mid- 19th century. Among the significant waterways in the U.S. were the Erie Canal, several canals linking the Great Lakes, and one connecting the Great Lakes to the Mississippi River. Modern waterway engineering enables larger vessels to travel faster by reducing delays at locks. See also Grand Canal, Panama Canal, Suez Canal. See illustration on following page.

Canal Zone or Panama Canal Zone Strip of territory, a historic administrative entity in Panama over which the U.S. formerly exercised jurisdictional rights (1903-79). The zone came into being in 1904 when Panama granted the U.S., in return for annual payments, sole right to operate and control the Panama Canal, including a strip of land 10 mi (16 km) wide along the canal extending from the Atlantic to the Pacific Ocean and bisecting the Isthmus of Panama. The zone was abolished by treaty in 1979, and civil control of the territory was returned to Panama. By the same treaty a commission under joint U.S. -Panamanian ownership was established to operate the canal until the year 2000, when Panama assumed full control.

Canaletto \,ka-n 3 l-'e-to\ orig. Giovanni Antonio Canal (b. Oct. 18, 1697, Venice, Republic of Venice — d. April 20, 1768, Venice) Italian painter and etcher. He was trained in the studio of his father, a theatrical scene painter. From 1719 to 1720 he worked in Rome, painting scenes for operas, until he turned to painting topographical images. After his return

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to the upper pool through the chamber (or pound) on the left; downstream traffic uses the pound on the right.

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to Venice, he produced the picturesque views (vedute) that would bring him international fame. His pictures provide dramatic views of Venetian architecture and demonstrate skill in rendering sunlight and shadow. In the 1730s he was kept busy meeting foreign visitors' demand for souvenir views of Venice. When the War of the Austrian Succession made foreign visitors scarce, he expanded his output to include imaginative views of Roman ruins, and in 1746 he went to England to paint views of London and the great English country houses. In 1763 he was elected to the Vene- tian Academy. The most famous topographical painter of the 1 8th century,

he influenced succeeding generations of landscape artists. He is not to be confused with his nephew Bernardo Bellotto, also known as Canaletto.

Canaris \ka-'na-ros\, Wilhelm (Franz) (b. Jan. 1, 1887, Aplerbeck, Westphalia, Ger. — d. April 9, 1945, Flossenbiirg concentration camp, Bavaria) German naval officer. Under Adolf Hitler, Canaris became head of military intelligence (Abwehr) in 1935. Believing that the Nazi regime would destroy traditional conservative values and that its foreign ambitions were dangerous to Germany, he enlisted some of the anti-Hitler conspirators into the Abwehr and shielded their activities. After the abortive July Plot against Hitler in 1944, Canaris was arrested and executed.

canary Popular cage bird (Serinus canaria; in the goldfinch family, Carduelidae) that owes its coloration and sustained vocal powers to 400 years of selective breeding. Varieties called rollers trill almost continuously; choppers have a loud trill of distinct notes. Well-known breeds include Hartz Mountain, Norwich, and Yorkshire. The average life span of a caged canary is 10-15 years.

The canary is native to the Canary,

Azores, and Madeira islands. The wild form is streak-backed and mostly greenish brown.

Canary Islands Spanish Islas Canarias Island group and autonomous community (pop., 2005 est.: 1,968,280) of Spain located in the Atlantic Ocean 67 mi (108 km) off the

northwestern coast of Africa. The islands comprise two provinces, Santa Cruz de Tenerife and Las Palmas, with an area of 2,876 sq mi (7,447 sq km). The capital is Santa Cruz de Tenerife. Known in ancient times as the “Fortunate Islands,” they were written about by both Plutarch and Pliny the Elder. Believed to be the western limit of the world, they were visited in the Middle Ages by Arabs, Genoese, Majorcans, Portuguese, and French. They were taken by Castile (see Castile- Leon) in 1404, and their indigenous inhabitants, the Guanche and Canario, were gradually conquered during the 15th century. The islands became a stop on the usual route for Spanish trading vessels with the New World. Today agriculture is an economic mainstay, as is an expanding tourist trade.

canasta \k3-'nas-t9\ Form of rummy, using two full decks, in which players or partnerships try to meld groups of three or more cards of the same rank and score bonuses for seven-card melds. Eleven cards are dealt to each player, the undealt portion of the pack is placed on the table, and the top card is turned up to start the discard pile. Each player in turn must draw, may meld, and must discard one card. A hand ends when a player melds his last card (goes out). Canasta originated in Uruguay in the late 1940s; its name (meaning “basket”) is probably a reference to the tray for holding discards.

Canaveral Vko-'na-vo-roL, Cape Cape, eastern Florida, U.S. It is the location of NASA’s John F. Kennedy Space Center and the launch site

of U.S. spaceflights, which included the first U.S. manned spaceflight (1961), the first lunar-landing flight (1969), and flights of the space shuttle Challenger, which exploded shortly after liftoff in 1986. After the death of Pres. John F. Kennedy in 1963, it was renamed Cape Kennedy; it reverted to its original name in 1973.

Canberra \'kan-ber-o\ City (pop., 2004 est.: metro, area, 377,074), capital of Australia. Located in the Australian Capital Territory, on the Molonglo River, it was chosen in 1909 as the site of the capital. An international competition held in 1911 chose the U.S. architect Walter Burley Griffin (b. 1876 — d. 1937) to design the city, and construction began in 1913. The transfer of Parliament from Melbourne took place in 1927. The city continues to expand, with residential development taking place in satellite towns. There is light industry and a growing tourist trade, though government functions dominate.

A statue by Henry Moore sits on the grounds of the National Library of Australia in Canberra.

ROBIN SMITH PHOTOGRAPHY, NEW SOUTH WALES

cancer Uncontrolled multiplication of abnormal cells. Cancerous cells and tissues have abnormal growth rates, shapes, sizes, and functioning. Cancer may progress in stages from a localized tumour (confined to the site of origin) to direct extension (spread into nearby tissue or lymph nodes) and metastasis (spread to more distant sites via the blood or lymphatic system). This malignant growth pattern distinguishes cancerous tumours from benign ones. Cancer is also classified by grade, the extent to which cell characteristics remain specific to their tissue of origin. Both stage and grade affect the chances of survival. Genetic factors and immune status affect sus-

Canary (Serinus canaria).

ERIC HOSKING

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ceptibility. Triggers include hormones, viruses, smoking, diet, and radiation. Cancer can begin in almost any tissue, including blood (see leukemia) and lymph (see lymphoma). When it metastasizes, it remains a cancer of its tissue of origin. Early diagnosis and treatment increase the chance of cure. Treatment may include chemotherapy, surgery, and radiation therapy. See also BLADDER CANCER; BREAST CANCER; CARCINOGEN; COLORECTAL CANCER; KAPOSI SARCOMA; LARYNGEAL CANCER; LUNG CANCER; OVARIAN CANCER; PANCREATIC CANCER; PROSTATE CANCER; SKIN CANCER; STOMACH CANCER; UTERINE CANCER.

Cancer (Latin: “Crab”) In astronomy, the constellation lying between Leo and Gemini; in astrology, the fourth sign of the zodiac, governing approximately the period June 22-July 22. It is represented as a crab (or crayfish), a reference to the crab in Greek mythology that pinched Heracles while he was fighting the Lernaean hydra. Heracles crushed the crab, but his enemy Hera rewarded it by placing it in the sky as a constellation.

Cancer, Tropic of See Tropic of Cancer

Cancun \kan-'kiin\ City (pop., 2000: 397,191) and island resort, southeastern Mexico. The city, on the northeastern coast of the Yucatan Peninsula, is a service town for the resort on Cancun Island (13 mi [21 km] long), which is connected by a causeway to the city. Originally settled by Maya Indians, the area was first described by John Lloyd Stephens and Frederick Catherwood in their Incidents of Travel in Yucatan (1843). Cancun remained a fishing village until 1970, when the area was selected as a suitable site for a resort. The plan proved hugely successful; today Cancun is one of Mexico’s busiest resorts.

Candela Xkan-'da-loX, Felix (b. Jan. 27, 1910, Madrid, Spain — d. Dec. 7, 1997, Durham, N.C., U.S.) Spanish Mexican engineer and architect. He immigrated to Mexico in 1939 and began to design and construct buildings there. His ferroconcrete structures are distinguished by thin, curved shells that are extremely strong and economical; his imaginative use of paraboloid barrel-vaulting helped dispel mistaken notions of the limits of this material. Notable works include the expressionistic church of Nuestra Senora de los Milagros in Mexico City (1955), with a hyperbolic paraboloid roof of ferroconcrete only 1.5 in. (3.8 cm) thick.

Candida Vkan-do-doX Any of the parasitic imperfect fungi (see fungus) that make up the genus Candida, which resemble yeasts and occur especially in the mouth, vagina, and intestinal tract. Though usually benign, Candidas can become pathogenic, causing diseases including candidiasis and thrush.

Candlemas (February 2) In the Christian church, the celebration of the presentation of the infant Jesus and the post-childbirth purification of Mary in the Temple, in accordance with Jewish law. The Greek church calls it Hypapante (“Meeting”) in reference to Jesus’ meeting there with Simeon, to whom it had been revealed that he would not die before meeting the Messiah. The festival is first documented in Jerusalem in the late 4th century; the custom of observing it with lighted candles (the source of its name) dates to at least the mid-5th century. The popular nonreligious holiday Groundhog Day developed, in part, from the medieval tradition that certain animals interrupted their hibernation on this day.

Candolle \ka n -'d6l\, Augustin (Pyrame de) (b. Feb. 4, 1778, Geneva, Switz. — d. Sept. 9, 1841, Geneva) Swiss botanist. In Paris (from 1796) he became an assistant to Georges Cuvier and worked with Lamarck on revising his botanical works. He carried out a government-commissioned botanical and agricultural survey of France (1806-12). In 1813 he published his most important work, Theorie elementaire de la botanique , in which he contended that plant anatomy, not physiology, must be the basis of classification, for which he coined the term taxonomy. He introduced the concept of homologous parts for plants (following Cuvier’s work on animals). From 1817 until his death he taught at the Uni-

versity of Geneva. He outlined systematic laws of botanical nomenclature (1818-21); his taxonomy suffered from certain weaknesses, but he achieved extensive subdivision of flowering plants, describing 161 families of dicotyledons, and his system supplanted that of Carolus Linnaeus. He completed seven volumes of a descriptive classification of all known seed plants (from 1824).

Candomble \ l kan-dom- , bla\ Variant of Macumba, a syncretic Afro-Brazilian religion most prominent in the Brazilian state of Bahia. Incorporating elements of Roman Catholicism, Candomble is the most African of the Afro-Brazilian sects. Its deities, called orixas, have distinct personalities (often capricious) and are associated with occupations, colours, days of the week, and natural phenomena. Rituals include animal sacrifice, spirit offerings, and dances. See also Macumba; vodun.

Candra Gupta See Chandragupta Maurya
Candra Gupta II See Chandra Gupta II

candy Sweet sugar- or chocolate-based confection. The Egyptians made candy from honey (combined with figs, dates, nuts, and spices), sugar being unknown. With the spread of sugarcane cultivation in the 15th century, the industry began to grow. In the late 18th century the first candy-manufacturing machinery was produced. The main ingredients are cane and beet sugars combined with other carbohydrate foods such as corn syrup, cornstarch, honey, molasses, and maple sugar. To the sweet base are added chocolate, fruits, nuts, peanuts, eggs, milk, flavours, and colours. Common varieties include hard candies (crystallized sugar), caramels and toffees, nougats, jellies, fondants, marshmallows, marzipans, truffles, cotton candies, licorices, and chewing gums.

cane Hollow or pithy and usually slender and flexible jointed stem (as of a reed). Also, any of various slender woody stems, especially an elongated flowering or fruiting stem (as of a rose) usually arising directly from the ground. The term is also applied to any of various tall woody grasses or reeds, including the coarse grasses of the genus Arundinaria (see bamboo), SUGARCANE, and SORGHUM.

Canetti, Elias (b. July 25, 1905, Ruse, Bulg. — d. Aug. 14, 1994, Zurich, Switz.) Bulgarian-born British novelist and playwright. Canetti was from a Spanish-speaking Jewish family. His best-known work, the novel Auto-da-Fe (1935), deals with the dangers in believing that detached intellectualism can prevail over evil and chaos. He settled in Britain in 1938. Later works that reflect his interest in the psychopathology of power include Crowds and Power (1960); the plays The Wedding (1932), Comedy of Vanity (1950), and Life -Terms (1964); and his series of autobiographies beginning with The Tongue Set Free (1977). He was awarded the Nobel Prize for Literature in 1981.

Cange \'ka n zh\, Charles du
Fresne, Lord du (b. Dec. 18,

1610, Amiens, France — d. Oct. 23,

1688, , Paris) French scholar. Du
Cange's most important works, A Glossary for Writers of Middle and Low
Latin (1678) and A Glossary for Writers of Middle and Low Greek (1688),
made use of his encyclopaedic knowledge not only of languages but of
history, law, archaeology, and geography. His historical approach and
effort to distinguish medieval vocabularies from their classical counter-
parts inspired later scholars to examine the development of language from
a historical perspective. Frequently reedited, his dictionaries retained their
usefulness through the 20th century.

canine or canid Vka-nod, 'ka-nod\ Any domestic or wild dog or dog-
like mammal (e.g., wolf, jackal, fox) in the family Canidae, found through-
out the world except in Antarctica and on most ocean islands. Canines
tend to be slender and long-legged, with a long muzzle, bushy tail, erect
pointed ears, and well-developed canine and cheek teeth. They prey on
all types of animals; some also eat carrion and vegetable matter. They
probably were the first animals to be domesticated. Though helpful in
controlling rodent and rabbit populations, canines have been hunted for
their pelts and slaughtered to prevent their reputed (and sometimes real)
destruction of livestock and large game.

cankerworm See looper

canna Any of the tropical herbaceous plants that make up the family
Cannaceae, of the ginger order (Zingiberales), containing a single genus
with about 55 species, found from southeastern North America through
South America. Cannas have rhizomes with erect stems growing to 10 ft
(3 m) high. The green or bronze leaves are spirally arranged. The flow-
ers are asymmetrical. Spotted variations of the scarlet, red-orange, or yel-

Canetti

HORST TAPPE/CAMERA PRESS/GLOBE PHOTOS

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low flowers sometimes occur. The genus Carina is widely grown for
ornamental use. C. edulis, from Peru, has edible, starchy rhizomes.

cannabis Vka-n3-b9s\ Any plant of the genus Cannabis, which contains
a single species, C. sativa. It is widely cultivated throughout the northern
temperate zone. Hemp fiber is obtained from a tall, canelike variety, while

marijuana is obtained from the female plant of a smaller variety.

Cannae Vka-ne\, Battle of (216 bc) Major battle near the ancient village of Cannae, in Apulia, southeastern Italy, during the Second Punic War. The Romans, with 80,000 men, met the 50,000 Carthaginian and allied African, Gallic, and Spanish troops under Hannibal’s command and were crushed by them. Hannibal’s troops gradually surrounded their foes and annihilated them in a classic example of the “double envelopment” maneuver. Roman losses exceeded 65,000 men, while the Carthaginians lost only about 6,000.

Cannes \'kan\ City (pop., 1999: 67,304), southeastern France. Located on the Mediterranean Sea southwest of Nice, it is an international resort. Probably settled by Ligurians, it was occupied successively by Phocaeans, Celts, and Romans. In the 10th century the monks of Lerins built fortifications to guard against Muslim sea raiders. Napoleon, on his return from Elba in 1815, camped nearby. A resort since the 19th century, the city is home to the Cannes Film Festival.

Cannes Film Festival \'kan\ Film festival held annually in Cannes, France. First held in 1946 for the recognition of artistic achievement, the festival came to provide a rendezvous for those interested in the art and influence of the movies. Like other film festivals, it became an international marketplace where producers and distributors could exchange ideas, view films, and sign contracts. The phenomenon of international coproduction arose at Cannes in the late 1940s. The festival was at times the site of artistic contention as well, as in 1958-59, when advocates and opponents of the French New Wave exchanged diatribes and manifestos.

cannibalism The usually ritualistic eating of human flesh by humans. The term derives from the Spanish name (Carfbales or Canfbales) for the Carib people, first encountered by Christopher Columbus. Reliable first-hand accounts of the practice are comparatively rare, causing some to question whether full-blown cannibalism has ever existed. Most agree that the consumption of particular portions or organs was a ritual means by which certain qualities of the person eaten might be obtained or by which powers of witchcraft and sorcery might be exercised. In some cases, a small portion of the dead person was ritually eaten by relatives. Headhunters (see headhunting) sometimes consumed bits of the bodies or heads of deceased enemies. The Aztecs apparently practiced cannibalism on a large scale as part of the ritual of human sacrifice.

cannibalism In zoology, the eating of any animal by another member of the same species. Certain ants regularly consume injured immatures and, when food is scarce, eat healthy immatures; this practice allows the adults to survive the food shortage and live to breed again. Male lions taking over a pride may kill and eat the existing young. After losing her cubs the mother will become impregnated by the new dominant male, thereby ensuring his genetic contribution. Aquarium guppies sometimes regulate their population size by eating most of their young.

canning Method of preserving food from spoilage by storing it in containers that are hermetically sealed and then sterilized by heat. The process was invented in 1809 by Nicolas Appert (b. c. 1750 — d. 1841) of France, who used glass bottles. In the 19th century tin-coated iron cans with soldered tops, bottoms, and seams were used, but in the early 20th century these were replaced by tin-plated steel containers with interlocking seams and polymer seals. In the later 20th century seamless alumi-

num cans (punched out from a single sheet) capped with a steel or aluminum lid became common, particularly in the beverage industry. In modern canning, food is passed under hot water or steam, transferred to a sterile container, sealed inside, and subjected to heat sufficient to kill any remaining microorganisms, cooking the food. The process preserves most nutrients but often affects consistency and taste.

Canning, George (b. April 11, 1770, London, Eng. — d. Aug. 8, 1827, Chiswick, near London) British politician. As a young man, he came under the influence of William Pitt, who helped him win a seat in Parliament (1793) and a post as undersecretary for foreign affairs (1796-99). Canning served twice as foreign secretary (1807-09, 1822-27); his policies included cutting England adrift from the Holy Alliance and recognizing the independence of the Spanish American colonies. He became prime

minister in 1827 but died a few months later. He helped the Tory Party take a more liberal view on many questions of domestic, colonial, and foreign policy.

Canning, Stratford, Viscount Stratford (of Redcliffe) (b. Nov.

4, 1786, London, Eng. — d. Aug. 14,

1880, Frant, Sussex) British diplomat. A cousin of George Canning, he served as minister to Switzerland (1814-18) and later to the U.S.

(1820-23). As ambassador to Constantinople intermittently for almost 20 years, he exerted a strong influence on Turkish policy. He was involved with the movement for Greek independence from Turkey.

He later became friends with the Ottoman sultan and encouraged the Tanzimat program of reforms. He supported Turkish resistance to Russian attempts to influence Ottoman affairs and tried in vain to prevent the Crimean War. He retired after leaving Turkey in 1858.

cannon Long-range artillery piece, as distinguished from other big guns such as the howitzer or mortar. Early cannons, appearing in Europe in the 15th century, were smooth-bored and forged of iron, weighed 6,000-8,000 lbs (2,800-3,600 kg) and were loaded through the muzzle. They were mounted on wheeled carriages, which were thrown backward when the cannon was fired. Rifled bores and breechloading were adopted in the later 19th century, and new mechanisms such as the hydraulic buffer absorbed the recoil. Before 1850 ammunition was either cannister, grapeshot, or round, solid cannonballs and black powder, but rifled bores made possible the use of elongated projectiles, which had a longer range. The

shrapnel shell was widely used in the 19th-20th century. Modern cannons, of high-grade steel, are towed on split-trail carriages or are mounted on tracked vehicles; a common calibre is 155 mm (6 in.). Many helicopters, airplanes, and naval vessels are equipped with multibarreled, Gatling-type rotary cannons firing 20-mm exploding shells.

Cannon, Joseph (Gurney) (b. May 7, 1836, Guilford county, N.C., U.S. — d. Nov. 12, 1926, Danville, 111.) U.S. politician. He began practicing law in Illinois in 1859. Elected to the U.S. House of Representatives in 1872, he served 46 years (1873-91, 1893-1913, 1915-23). A staunchly conservative Republican, he used his power as speaker (1903-11) in a partisan manner. In 1910 a coalition of Democrats and insurgent Republicans passed a resolution that made the speaker ineligible for membership on the rules committee, the main source of his power. Personally well liked, he was popularly known as “Uncle Joe.”

Cannon, Walter B(radford) (b. Oct. 19, 1871, Prairie du Chien, Wis., U.S. — d. Oct. 1, 1945, Franklin, N.H.) U.S. neurologist and physiologist. He was the first to use X rays in physiological studies. He also investigated hemorrhagic and traumatic shock during World War I and worked on methods of blood storage. He researched the emergency functions of the sympathetic nervous system and homeostasis and sympathin, an epinephrine-like substance released by certain neurons. With Philip Bal'd he developed the Cannon-Bard theory, which proposed that emotional and physiological responses to external situations arise simultaneously and that both prepare the body to deal with the situation.

Cano Vka-no\, Alonso (b. March 19, 1601, Granada, Spain — d. Sept. 3, 1667, Granada) Spanish painter, sculptor, and architect. He studied in Sevilla with Francisco Pacheco and was active as court painter in Madrid (1638-44). Despite a violent temperament, Cano produced serene and elegant religious paintings and sculpture. He worked for much of his career in Granada, where he designed the facade of the Granada Cathedral (1667), one of the masterpieces of Spanish Baroque architecture. He is often called the Spanish Michelangelo for the diversity of his talents.

canoe Lightweight boat pointed at both ends and propelled by one or more paddles. The earliest canoes had light frames of wood covered by tightly stretched tree bark. The birchbark canoe was first used by the

George Canning, painting by Sir Thomas Lawrence and Richard Evans; in the National Portrait Gallery, London.

COURTESY OF THE NATIONAL PORTRAIT GALLERY, LONDON

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Algonquian Indians in what is now the northeastern U.S. and Canada, and its use passed westward. Canoes were often about 20 ft (6 m) in length, though war canoes might be as long as 100 ft (30 m). The dugout canoe, made from a hollowed-out log, was used by Indians in what is now the southeastern U.S. and along the Pacific coast as far north as Canada, as well as by peoples in Africa and New Zealand. Modern canoes are made of wood, canvas over wood frames, aluminum, and molded plastic or fibreglass. Most are open from end to end, but the kayak is also considered a canoe. See also canoeing.

canoeing Use of a canoe or kayak for recreation or competition. Both types of boat are used in water touring, in speed competitions, and in white-water sport, or navigation through rapids (which includes, in the case of kayaks, ocean surf). The Scottish philanthropist John MacGregor (1825-1892) is traditionally credited with establishing the modem outdoor activity of canoeing in the 1860s. Canoeing events became part of the Olympic Games in 1936 (1948 for women). In addition to various singles, pairs, and team still-water events for distance and speed, there are white- water racing competitions and, for kayaks, slalom events involving the use of gates similar to those of slalom skiing.

canon Musical form and compositional technique. Canons are characterized by having a melody that is imitated at a specified time interval by one or more parts, either at the same pitch or at some other pitch. Imitation may occur in the same note values, in augmentation (longer notes), or in diminution (shorter notes); in retrograde order (beginning at its end), mirror inversion (each ascending melodic interval becoming a descending interval, and vice versa), or retrograde mirror inversion; and so on. Canons range from folk rounds such as “Three Blind Mice” and “Frere Jacques” to the massively complex canons of Johann Sebastian Bach.

canon law Body of laws established within Roman Catholicism, Eastern Orthodoxy, independent churches of Eastern Christianity, and the Anglican Communion for church governance. Canon law concerns the constitution of the church, relations between it and other bodies, and matters of internal discipline. The ecclesiastical lawyer and teacher Gratian published the first definitive collection of Roman Catholic canon law c. 1140; the Decretum Gratiani drew on older local collections, councils, Roman law, and church fathers. The enlarged Corpus juris canonici (“Body of Canon Law”) was published in 1500. A commission of cardinals issued the new Codex juris canonici (“Code of Canon Law”) in 1917, and a revised version was commissioned after the Second Vatican Council and published in 1983. Following the Schism of 1054, the Eastern Orthodox church developed its own canon law under the patriarch of Constantinople. The Anglican, Coptic, and Ethiopian Orthodox churches also formulated their own collections.

canonization Official act of a Christian church declaring a deceased member worthy of veneration and entering his or her name in the canon (authorized list) of saints. The cult of local martyrs was widespread in the early church, and by the 10th century church authorities were considering the need for formal recognition of saints by Rome, a change that was formalized by Gregory IX in the 13th century. Responsibility for beatification (declaring a person worthy of limited veneration) was assigned to the Roman Curia under Sixtus V (r. 1585-90). A candidate’s writings, miracles, and reputation for sanctity are investigated: one official gathers evidence in favor of beatification; another (the “devil’s advocate”) is

charged with seeing that the entire truth is made known about the candidate. Canonization requires proof of two miracles subsequent to beatification. The process in the Eastern Orthodox Church is less formal; popular devotion by the faithful serving as the usual basis for sainthood.

canopic jar In ancient Egyptian funerary ritual, a covered vessel of wood, stone, pottery, or faience containing the embalmed viscera removed from a body during mummification. First used during the Old Kingdom (c. 2575-c. 2130 bc), the jars became more elaborate during the Middle Kingdom (c. 1938-c. 1600 bc), when their lids were decorated with sculpted human heads (probably representations of the deceased). From the 19th dynasty until the end of the New Kingdom (1539-1075 bc), the heads represented the four sons of Horus. During the 20th dynasty (11 90—1075 bc), the practice began of returning the viscera to the body, and the art of canopic jars declined.

Canova, Antonio (b. Nov. 1, 1757, Possagno, Republic of Venice — d. Oct. 13, 1822, Venice) Italian sculptor. Apprenticed to a sculptor at an early age, he opened his own studio in Venice by 1775. In 1778-79 he produced his first important sculpture, Daedalus and Icarus', the figures

were so realistic that he was accused of making plaster casts from live models. He settled in Rome in 1779 and became strongly influenced by Classical antiquity. Among his most important commissions were the tombs of two popes, Clement XIII and Clement XIV. In 1802 he became court sculptor to Napoleon I in Paris. In 1816 Pope Pius VII awarded him the title of marquis of Ischia for arranging the return of Italian art looted by the French. Canova also painted portraits and re-creations of paintings discovered at Pompeii and Herculaneum. He dominated European sculpture around the turn of the century and was of primary importance in the development of the Neoclassical style in sculpture (see Classicism and Neoclassicism).

Canso, Strait of or Canso Gut Channel, Nova Scotia, Canada. Separating mainland Nova Scotia and Cape Breton Island, it is 4.5 mi (23 km) long and 1 mi (2 km) wide, with depths of 200 ft (60 m). Since 1955 the 7,000-ft (2,100-m) Canso Causeway has linked Cape Breton with the mainland. A navigation lock can handle most oceangoing vessels.

Cantabria \kan-'ta-bre-9\ Historical region, autonomous community (pop., 2001: 535,131), and province, northern Spain. It borders the Bay of Biscay and covers an area of 2,054 sq mi (5,321 sq km); its coastal hills rise gradually into the Cantabrian Mountains. Its capital is Santander. The Cantabri, an Iberian tribe, dominated the region until 19 bc, when they were subdued by the Romans. Because of its isolation, the area was little affected by the Iberian Moorish invasions (c. 8th— 1 1th centuries). In the Middle Ages, Cantabria came under Castilian influence. The region itself was formerly known as Santander, and much of its population is centred on the city of the same name. Mining is an important part of the economy.

Cantabrian Mountains \kan-'ta-bre-on\ Mountain range, northern Spain. The mountains, which extend about 180 mi (300 km), are geologically of similar origin to the Pyrenees, though classified as a separate formation. They include many tall peaks, the highest being Torre de Cerredo (8,787 ft, or 2,678 m), and thus form a more formidable barrier than the Pyrenees. The region is economically important for its coal and iron.

cantata Work for voice or voices and instruments of the Baroque era. From its beginnings in early 17th-century Italy, both secular and religious cantatas were written. The earliest cantatas were generally for solo voice and minimal instrumental accompaniment. Cantatas soon developed a dramatic character and alternating sections of recitative and aria, paralleling the simultaneous development of opera, and they came to resemble unstaged operatic scenes or acts. In Germany the Lutheran cantata developed more directly out of the expanding choral motet, and almost always involved a chorus. A single chorale (hymn) often served as the basis for an entire cantata, which might have up to 10 diverse numbers, including duets, recitatives, and choral fugues. The most celebrated are the approximately 200 written by Johann Sebastian Bach. After c. 1750 the cantata gradually declined.

Canterbury Historic city and administrative district (pop., 2001: 135,287), southeastern England. Located on the River Great Stour, the site has been occupied since pre-Roman times; the Roman town of Durovernum Cantiacorum was established after Claudius invaded Britain in ad 43. It has been an ecclesiastical metropolis of England since St. Augustine of Canterbury founded a monastery there in 602 and later established a cathedral. The cathedral was the scene of the murder of Archbishop St. Thomas Becket in 1170. After his canonization in 1172, it became a pilgrimage shrine; it is the destination of the pilgrims in Geoffrey Chaucer’s Canterbury Tales. Canterbury was heavily bombed in World War II, but the cathedral largely escaped damage. The cathedral and other historic buildings were designated a UNESCO World Heritage site in 1988.

cantilever \'kan-t3-,le-v3r\ Projecting beam or other horizontal member supported at one or more points but not at both ends. Some engineers distinguish between a cantilever, supported at only one fixed end, and an overhanging beam that projects beyond one of its end supports. The free, unsupported end is capable of supporting a weight or surface, such as a concrete slab. Any beam built into a wall with a projecting free end forms a cantilever, which may carry a balcony, canopy, roof, or part of a building above. Cantilevering can be used for constructions as simple as bookshelves or as complicated as bridges.

canton Political subdivision of Switzerland, France, and some other European countries. Each of Switzerland’s 26 cantons and half-cantons has its own constitution, legislature, executive, and judiciary. Five pre-

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serve the ancient democratic assembly, in which all citizens meet; the remaining 2 1 have a cantonal legislature with elective representatives and usually proportional representation. In France, the canton is a territorial and administrative subdivision of an arrondissement but not an actual unit of local government.

Canton See Guangzhou

Canton system System of trade that developed between Chinese and foreign merchants in the southern China city of Guangzhou (Canton). From 1759 to 1842, all foreign trade coming into China was confined to Guangzhou and had to be conducted with authorized Chinese merchants. Foreign merchants were confined to a small area outside the city wall and were subject to Chinese law and other restrictions. British merchants' complaints grew during the early 19th century, and, with Britain's victory in the first Opium War (1839-42), China was forced to abolish the system. See also British East India Co.; Treaty of Nanjing.

cantor In Judaism and Christianity, an official in charge of music or chants. In Judaism the hazzan (cantor) leads liturgical prayer and chanting. In medieval Christianity the cantor had charge of a cathedral's music — specifically, of supervising the choir's singing. The term also designated the head of a college of church music.

Cantor, Eddie orig. Edward Israel Iskowitz (b. Jan. 31, 1892, New York, N.Y., U.S. — d. Oct. 10, 1964, Hollywood, Los Angeles, Calif.) U.S. comedian and singer. As a child, Cantor clowned and sang for coins on street comers in his native New York City. He dropped out of elementary school, could not keep a job because of his irrepressible clowning, and soon went into vaudeville as a blackface song-and-dance man. He toured with Florenz Ziegfeld's Follies and the Shuberts. He appeared in several Broadway reviews, and from 1923 to 1926 he was a star in Kid Boots. From 1931 Cantor performed for 18 years on The Chase and Sanborn Hour as a standup comedian. His films include Roman Scandals (1 933) and Strike Me Pink (1936). In the 1950s he hosted a television show.

Cantor \'kan-tor\, Georg (b. March 3, 1845, St. Petersburg, Russia — d. Jan. 6, 1918, Halle, Ger.) German mathematician, founder of set theory. He was the first to examine number systems, such as the rational numbers and the real numbers, systematically as complete entities, or sets. This led him to the surprising discovery that not all infinite sets are the same size. In particular, he showed that the rational numbers could be put in a one-to-one correspondence with the counting numbers; hence the set is countable. He also showed that no such correspondence is possible for the much larger set of irrational numbers; hence they are known as an uncountable set. His investigations led him to the classification of transfinite numbers, which are, informally speaking, degrees of infinity.

cantus firmus Latin "fixed chant" Preexistent melody, such as a plainchant (see Gregorian chant) excerpt, underlying a polyphonic musical composition (one consisting of several independent voices or parts). In the 11th- and 12th-century organum, the tones of the plainchant melody for such words as "alleluia" and "amen" were held by one voice (the tenor), while another, more active, improvised line was added. Developments introduced by the Notre- Dame school of the late 12th and early 13th centuries included rhythmic patterning of the added voice and the addition of two or three voices. The composition of nonliturgical words for the added voice or voices in the 13th century resulted in the independent motet. Cantus firmus technique remained the basis of most composition of the 14th— 15th centuries (though the "chant" was now often a secular melody) and remained important in the 16th-century mass. It was later codified in the pedagogical method called species counterpoint.

Canute Vko-'niitV the Great Danish Knut (d. Nov. 12, 1035) Danish

king of England (1016-35), Denmark (1019-35), and Norway (1028-35). He helped his father, Sweyn I, invade England in 1013. Sweyn was accepted as king of England after exiling King Ethelred II but died in 1014; Canute returned and defeated Ethelred' s son to win the English throne in 1016. At first he ruled ruthlessly, killing English opponents and appointing Danes in their places, but within a few years he had married Ethelred' s widow and was granting earldoms to Englishmen. Canute proved an effective ruler who brought peace and prosperity to England, issued an important law code, and became a strong supporter of the church. With English help he secured the throne of Denmark on his brother's death. His early death and that of his sons led to the restoration of Ethelred' s dynasty.

canvas Stout cloth. Canvas (probably named for cannabis, or hemp), has been made from hemp and flax fibres since ancient times to produce cloth

for sails. More recently it has also been made from tow, jute, cotton, and mixtures of such fibres. Flax canvas is essentially of double warp (see weaving), being invariably intended to withstand pressure or rough usage. Articles made from canvas include camera and golf bags, running shoes, tents, and mailbags. Tarred canvas is used for tarpaulins to cover goods. Artists' canvas for painting is much lighter than sail canvas; those of the best quality are made of cream or bleached flax fibre.

canvasback Diving duck (Aythya valisineria), one of the most popular game birds. The male weighs about 3 lb (1.4 kg). During the breeding season he has a red head and neck and a black breast, with a white back and sides finely lined in gray. In eclipse (nonbreeding) plumage, he resembles the female, with a tan head and gray-brown back. Canvasbacks breed in northwestern North America and winter along the coasts from British Columbia and Massachusetts south to central Mexico. They prefer the roots of wild celery (eelgrass) but will eat many other plants and even some small animals.

canyon Very narrow, deep valley cut by a river through resistant rock and having steep, almost vertical sides. Canyons occur most often in arid or semiarid regions. Some canyons (e.g., the Grand Canyon) are spectacular natural features. See also submarine canyon.

Canyon de Chelly \d3-'sha\ National Monument Preserve, northeastern Arizona, U.S. Located on the Navajo Indian reservation immediately east of Chinle, the preserve was established in 1931 and occupies 131 sq mi (339 sq km). It includes several hundred pre-Columbian cliff dwellings, some of them built in caves on the canyon walls. They represent a broader time span than any other ruins in the Southwest, with many dating from the 11th century. Modern Navajo homes and farms occupy the canyon floor.

Canyonlands National Park Park, southeastern Utah, U.S. The park, established in 1964, occupies a wilderness of water-eroded sandstone spires, canyons, and mesas extending over 527 sq mi (1,366 sq km). Some of its rock walls display Indian petroglyphs. The Needles section in its southern part contains the Angel and Druid arches, gigantic balanced rock formations.

Cao Cao \'tsau-'tsau\ or Ts'ao Ts'ao (b. ad 155, Boxian, China — d. 220, Luoyang) Chinese general who, at the end of the Han dynasty, assumed imperial prerogatives. Cao Cao rose to prominence when he

suppressed the Yellow Turban rebellion in the last years of the Han. Though the rebellion was suppressed, the dynasty was irreparably weakened, and in the ensuing chaos Cao Cao occupied the strategic northern section of China around the capital of Luoyang. His domain was known as the kingdom of Wei (see Three Kingdoms). Confucian historians and popular legends alike describe him as the archetypal unscrupulous villain; he is portrayed as such in the famous 14th-century novel Sanguozhi yanyi ("Romance of the Three Kingdoms"). His son, Cao Pei, founded the Wei dynasty (220-265/266).

Cao Dai \'kau-'dl\ Syncretist modern Vietnamese religious movement with a strongly nationalist political character. Cao Dai draws on ethical precepts from Confucianism, occult practices from Daoism, theories of karma and rebirth from Buddhism, and hierarchical organization (including a pope) from Roman Catholicism. It was formally established in 1926 by Ngo Van Chieu (1878-19267), a colonial administrator in French Indochina who professed to have had a communication from the supreme deity. The movement met with resistance from the Vietnamese government both before and after the communist takeover in 1975. It was reported to have some three million adherents in Vietnam and abroad in the early 21st century.

Cao Zhan Vtsau-'jan\ or Ts'ao Chan (b. 17157, Jiangning, Jiangsu province, China — d. Feb. 12, 1763, Beijing) Chinese novelist. He is the author of Dream of the Red Chamber (1791), generally considered China's greatest novel. A partly autobiographical work written in the vernacular, it describes in lingering detail the decline of a powerful family and an ill-fated love between cousins. Cao finished at least 80 of its 120 chapters; it was completed after his death, probably by Gao E, about whom little is known.

Capa, Robert orig. Andrei Friedmann (b. 1913, Budapest, Hung. — d. May 25, 1954, Thai Binh, Viet.) Hungarian-born U.S. photojournalist. In Paris he presented his photographs as the work of a fictitious rich American, Robert Capa; the deception was soon discovered but he kept the name. He first achieved fame as a war correspondent in the

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Spanish Civil War (1936). In World War II he covered the fighting in Africa, Sicily, and Italy for Life magazine; images of the Normandy invasion are among his most memorable works. In 1947 he founded Magnum Photos with Henri Cartier-Bresson and David Seymour. He was killed by a land mine while photographing the French Indochina war for Life.

Capablanca, Jose (Raul) (b. Nov. 19, 1888, Havana, Cuba — d. March 8, 1942, New York, N.Y., U.S.) Cuban chess master. He learned chess from his father at age 4 and beat Cuba's best player at 12. He defeated Emanuel Lasker to become world champion in 1921; in 1927 he was defeated by Alexander Alekhine (1892-1946). From 1916 to 1924, while playing in many tournaments, he did not lose a game. In 1921 he

published an instruction manual, Chess Fundamentals.

capacitance Vko-'pa-so-tsnsV Property of a pair of electric conductors separated by a nonconducting material (such as air) that permits storage of electric energy by the separation of electric charge, and that is measured by the amount of separated charge that can be stored per unit of electric potential between the conductors. If electric charge is transferred between two initially uncharged conductors, they become equally (but oppositely) charged. A potential difference is set up between them and some of the electricity can be stored. Capacitance C is the ratio of the amount of charge q on one of the conductors to the potential difference V between the conductors, or C = q/V. The unit of capacitance is coulombs per volt (C/V), or farads (F).

Cape Agulhas See Cape Agulhas
Cape Ann See Cape Ann
Cape Bojador See Cape Bojador
Cape Bon Peninsula See SharIk Peninsua

Cape Breton \'bret- 3 n\ Island Island, (pop., 2001: 109,330), eastern part of Nova Scotia, Canada. Separated from the mainland by the Strait of Canso, it is 1 10 mi (175 km) long and up to 75 mi (120 km) wide, with an area of 3,981 sg mi (10,3 1 1 sq km). It contains the Bras d'Or salt lakes. Originally called lie Royale as a French colony, it later took the name of its eastern cape, probably the first land visited by John Cabot on his 1497-98 voyage and probably named by Basque fishermen from Cap Breton, France. It was ceded to the British by the 1763 Treaty of Paris and joined to Nova Scotia. In 1784 it became a separate British crown colony, but it was rejoined to Nova Scotia in 1820. In 1955 the island was linked to the mainland by a causeway. Cape Breton Highlands National Park was established in 1936. Tourism is an important industry on the island.

Cape buffalo Massive, black, horned buffalo {Syncerus caffer), formerly found throughout sub-Saharan Africa but now greatly reduced in number by disease and hunting. It is a gregarious animal of open or scrub-covered plains and open forests. When wounded, it is regarded as one of the most dangerous animals. It stands up to 5 ft (1.5 m) tall at the shoulder, and bulls can weigh almost a ton (about 900 kg). Its heavy horns typically curve downward, then up and inward. A smaller subspecies is found in dense West African forests.

Cape Canaveral See Canaveral, Cape

Cape Cod Peninsula, eastern Massachusetts, U.S. Some 65 mi (105 km) long and 1-20 mi (2-32 km) wide, it touches Buzzards Bay and extends into the Atlantic Ocean in a wide curve, enclosing Cape Cod Bay. The Cape Cod Canal, cutting across the base of the peninsula, forms part of the Atlantic Intracoastal Waterway. Named by an English explorer who visited its shores in 1602 and took aboard a “great store of codfish,” Cape Cod was the site, near Provincetown, of the Pilgrims’ landing in 1620. Extending into the warm Gulf Stream, it has coastal towns and villages that become densely populated resorts in summer. In the 19th century Provincetown was an active whaling port. The cape’s northern hook was designated the Cape Cod National Seashore in 1961.

Cape Colony See Cape Province
Cape Dezhnev See Cape Dezhnev

Cape Fear River River, central and southeastern North Carolina, U.S. Formed by the confluence of the Deep and Haw rivers, it flows southeast about 200 mi (320 km) to enter the Atlantic Ocean near Southport at Cape Fear. The southern estuary forms part of the Atlantic Intracoastal Waterway. A series of locks and dams makes the river navigable from Wilmington to Fayetteville.

Cape Hatteras Yha-ta-res\ National Seashore Scenic coastal area situated on Bodie, Hatteras, and Ocracoke islands along the Outer Banks, eastern North Carolina, U.S. The park, the country's first national seashore, was authorized in 1937 and established in 1953. It has a total area of 47 sq mi (122 sq km). It includes the tallest (208 ft [63 m]) masonry lighthouse in the country, located at Cape Hatteras.

Cape Horn See Cape Horn

Cape Krusenstern VkrU-zon-.stenA National Monument

National preserve, northwestern Alaska, U.S., on the coast of the Chukchi Sea. Established in 1978, it was enlarged in 1980 to 1,031 sq mi (2,670 sq km). Its remarkable archaeological sites illustrate the cultural evolution of the Arctic peoples over some 4,000 years.

Cape of Good Hope See Cape of Good Hope

Cape Province or Cape of Good Hope formerly (1826-1910) Cape Colony Former province, South Africa. Occupying the southern extremity of the African continent, it comprised the southern and western portions of South Africa; its capital was Cape Town. The black state of Ciskei and parts of two others, Transkei and Bophuthatswana, lay within its boundaries. Its name refers to the Cape of Good Hope, 30 mi (50 km) south of Cape Town. The original inhabitants included Bantu, San, and Khoekhoe peoples. Bartolomeu Dias, en route to India in 1488, became the first European to visit the area. A colony was founded by the Dutch at Table Bay in 1652; it was ceded to the British in 1814. It joined the Union of South Africa in 1910 and the Republic of South Africa in 1961. The province ceased to exist in 1994, when it was split roughly into Eastern Cape, Northern Cape, and Western Cape provinces.

Cape Town Afrikaans Kaapstad Vkap-,stat\ City (pop., 2005 est., urban agglom.: 3,103,000), legislative capital of the Republic of South Africa. It is also the capital of Western Cape province. Located on Table Bay, Cape Town has long been an important regional port. The first settlement at Table Bay, it was founded in the 17th century by the Dutch navigator Jan van Riebeeck for the Dutch East India Company, and it soon served as a stopover for ships plying the Europe-to-India route. It was under Dutch rule intermittently until it was taken by the British in 1806. Today it is a commercial and cultural centre. See also Pretoria; Bloemfontein.

Cape Verde \'vord\ officially Republic of Cape Verde Island country, east-central Atlantic Ocean. Lying 385 mi (620 km) off the west-

thirds of its population are Creole (mixed origin); the remainder are Euro-

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pean and black African. Languages: Portuguese (official), Crioulo (a Portuguese dialect). Religions: Christianity (predominantly Roman Catholic); also Islam. Currency: Cape Verde escudo. The mountainous windward islands are craggy and furrowed by erosion; the flat leeward islands are largely plains and lowlands. The archipelago is volcanic in origin. Fogo Island has an active volcano that erupted in 1951; it is also the location of the highest peak, which rises 9,281 ft (2,829 m). The other main islands are Santo Antao, Boa Vista, and Sao Tiago. Cape Verde has a developing mixed economy based largely on agriculture, though tourism has been promoted. It is a republic with one legislative house; its chief of state is the president and its head of government the prime minister. The islands were uninhabited when Diogo Gomes sighted and named Maio and Sao Tiago in 1460; in 1462 the first settlers landed on Sao Tiago, founding the city of Ribeira Grande. The city’s importance grew with the development of the slave trade, and its wealth attracted attacks so often that it was abandoned in 1712. The prosperity of the Portuguese-controlled islands vanished with the decline of the slave trade in the 19th century, when they were made a coaling and submarine cable station. In 1951 the colony became an overseas province of Portugal. Many islanders preferred outright independence, which was granted in 1975. Once associated politically with Guinea-Bissau, Cape Verde split from it in 1981.

Capek Vcha-pek\, Karel (b. Jan. 9, 1890, Male Svatonovice, Bohemia, Austria-Hungary — d. Dec. 25, 1938, Prague, Czech.) Czech novelist, short-story writer, and playwright. Capek’ s “black utopias,” works showing the dangers of technological progress, include the cautionary play R.U.R.: Rossum’s Universal Robots (1920), a depiction of a society dependent on mechanical workers called robots (a term he coined from a Czech word for forced labour). The comic fantasy The Insect Play (1921; with his brother Josef) satirizes human greed. The Makropoulos Affair (1922) was made into an opera by Leos JanAcek. Capek explored aspects of knowledge in the novel trilogy Hordubal (1933), Meteor (1934), and An Ordinary Life (1934).

caper Any of the low prickly shrubs that make up the genus Capparis (family Capparaceae), of the Mediterranean region. The European caperbush (C. spinosa) is known for its flower buds, which are pickled in vinegar and used as a spicy condiment. The term caper also refers to one of the pickled flower buds or young berries. Buds of C. decidua are eaten as potherbs, and curries are prepared from seeds and fruits of C. zeylandica.

Capernaum Vko-'por-na-omN Ancient city, Palestine. Located on the northwestern shore of the Lake Tiberias (Sea of Galilee), it was the home of Jesus for much of his ministry. His disciples Peter, Andrew, and Matthew were from Capernaum, and he was said to have performed many of his miracles there. Excavations begun in 1905 indicated that the cite of the ancient city is likely near modem Kefer Nahum, Israel. Among the

remains discovered was a synagogue dating from the 2nd-3rd century ad.

Capet, Hugh See Hugh Capet

Capetians \ko-'pe-sh3ns\ or Capets \'ka-pots\ Ruling house of France (987-1328), who laid the foundation of the French state. Descended from Robert the Strong (died 866), they included Hugh Capet (r. 987-96), the first Capetian king; Philip II Augustus (r. 1180-1223); and Louis IX (r.1226-70). Capetians also ruled as dukes of Burgundy and Brittany, emperors of Constantinople, counts of Artois and Provence, kings and queens of Naples, and kings of Hungary and Navarre.

capillarity \,ka-p3-'lar-9-te\ Rise or fall of liquid in a small passage or tube. When a glass tube of small internal diameter is inserted into water, the surface water molecules are attracted to the glass and the water level in the tube rises. The narrower the tube, the higher the water rises. The water is said to “wet” the tube. Water will also be drawn into the fibres of a towel, even if the towel is in a horizontal position. Conversely, if a glass tube is inserted into mercury, the level of the liquid in the tube falls. The mercury does not wet the tube. Capillarity is caused by the difference in attraction of the liquid molecules to each other and the attraction of the liquid molecules to those of the tube.

capillary Vka-p3-,ler-e\ Any of the minute blood vessels that form networks where the arterial and venous circulation (see artery, vein) meet for exchange of oxygen, nutrients, and wastes with body tissues. Capillaries are just large enough for red blood cells to pass through in single file. Their thin walls are semipermeable, allowing small molecules to pass

through in both directions. The smallest lymphatic vessels and minute bile channels in the liver are also called capillaries.

capital In architecture, the crowning member of a column, pier, pilaster, or other vertical form, providing a structural support and transition for the horizontal member (entablature) or arch above. In Classical styles, the capital is the architectural member that most readily identifies the order. Simple stone capitals have been found in the earliest known pyramids of ancient Egypt (c. 2890-2686 bc), at Saqqarah.

capital In economics, the stock of resources that are used to produce other goods now and in the future. In classical economics the three factors of production are capital, labour, and land. Capital embodies the man-made resources, which include the buildings, plant, equipment, and inventories created by all three factors. In this sense, capital goods may be contrasted with consumer goods. The creation of capital goods means that consumption is forgone, resulting in saving. The flow of saving becomes a flow of investment. Expenditures on education and training are often referred to as investment in human capital (see Gary S. Becker). Financial capital is the term given to the stocks and bonds issued in order to finance the acquisition of capital goods.

capital gains tax Tax levied on gains realized from the sale or exchange of capital assets. Though capital gains have been taxed in the U.S. since the advent of the federal income tax, certain capital gains are taxed less heavily than regular income, while others are exempted from taxation. This preferential treatment is intended to encourage investment and thereby stimulate economic growth. In theory the tax break encour-

ages investors to risk their capital in new ventures. Critics argue that preferential treatment results in distorted patterns of investment because regular income is converted into capital gains in order to avoid paying income tax. See also corporate income tax.

capital goods See producer goods

capital levy Direct tax assessed simultaneously on the capital resources of all persons possessing taxable wealth in excess of a minimum value and paid at least partly out of capital resources. It aims at capturing a substantial portion of the taxpayers' wealth to enable the government to cope with a major emergency or to redistribute wealth. Capital levies were adopted in many European nations after World Wars I and II.

capital punishment or death penalty Execution of an offender sentenced to death after conviction by a court of law of a criminal offense. Capital punishment for murder, treason, arson, and rape was widely employed in ancient Greece, and the Romans also used it for a wide range of offenses. It also has been sanctioned at one time or another by most of the world's major religions. In 1794 the U.S. state of Pennsylvania became the first jurisdiction to restrict the death penalty to first-degree murder, and in 1846 Michigan abolished capital punishment for all murders and other common crimes. In 1863 Venezuela became the first country to abolish capital punishment for all crimes. Portugal was the first European country to abolish the death penalty (1867). By the mid-1960s some 25 countries had abolished the death penalty for murder. During the last third of the 20th century, the number of abolitionist countries increased more than threefold. Despite the movement toward abolition, many countries have retained capital punishment, and some have extended its scope. In the U.S., three-fourths of the states and the federal government retain the death penalty, and death sentences are regularly carried out in China, Saudi Arabia, Singapore, and Iran. Supporters of the death penalty claim that life imprisonment is not an effective deterrent to criminal behaviour. Opponents maintain that the death penalty has never been an effective deterrent, that errors sometimes lead to the execution of innocent persons, and that capital punishment is imposed inequitably, mostly on the poor and on racial minorities.

capitalism or free-market economy or free-enterprise system Economic system in which most of the means of production are privately owned, and production is guided and income distributed largely through the operation of markets. Capitalism has been dominant in the Western world since the end of mercantilism. It was fostered by the Reformation, which sanctioned hard work and frugality, and by the rise of industry during the Industrial Revolution, especially the English textile industry (16th– 18th centuries). Unlike earlier systems, capitalism used the excess of production over consumption to enlarge productive capacity rather than investing it in economically unproductive enterprises such as palaces or cathedrals. The strong national states of the mercantilist era

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provided the social conditions, such as uniform monetary systems and legal codes, necessary for the rise of capitalism. The ideology of classical capitalism was expressed in Adam Smith’s Wealth of Nations (1776), and Smith’s free-market theories were widely adopted in the 19th century. In the 20th century the Great Depression effectively ended laissez-faire economics in most countries, but the demise of the state-run command economies of eastern Europe and the former Soviet Union (see communism) and the adoption of some free-market principles in China left capitalism unrivaled (if not untroubled) by the beginning of the 21st century.

Capitol, United States Meeting place of the U.S. Congress. In 1792 a competition for its design was won by William Thornton (1759-1828); his revised Federal-style design of 1795 was executed as the exterior of the wings adjacent to the central rotunda. Benjamin H. Latrobe, as Surveyor of Public Buildings (1803), followed Thornton’s conception of the exterior but used his own interior designs; perhaps his best-known contribution was his invention of tobacco-leaf and corn-cob capitals. After the British set fire to the Capitol in 1814, Latrobe began its reconstruction, but resigned in 1817. By 1827 his successor, Charles Bulfinch, had joined the two wings and built the first dome and the rotunda. In 1850 Thomas Ustick Walter (1804-1887) won a competition to expand the wings; he also designed the 287-ft- (87-m-) high cast-iron dome (1855-66), which was based on Michelangelo’s dome for St. Peter's Basilica. The marble and sandstone building contains about 540 rooms and stands in a 131 -acre (53-hectare) park.

Capitol Reef National Park Park, south-central Utah, U.S. Occupying 378 sq mi (979 sq km), it comprises great buttressed cliffs of coloured Navajo sandstone extending for 100 mi (160 km) along the western edge of the Waterpocket Fold. Established as a national monument in 1937, it became a national park in 1971. It is so named because its rock towers reminded geologists of coral reefs, while its dome-shaped formations suggest capitol architecture. The cliff walls are covered with pre-Columbian petroglyphs.

Capone, Al(phonse) (b. Jan. 17, 1899, Brooklyn, N.Y., U.S. — d. Jan. 25, 1947, Palm Island, Fla.) U.S. gangster. Quitting school after the sixth grade, he joined the James Street Boys gang, led by Johnny Torrio. In a youthful fight in a brothel-saloon he was slashed across the left cheek, prompting the later nickname “Scarface.” In 1919 he joined Torrio in Chicago to help run prostitution there. When Torrio retired (1925), Capone became the city’s crime czar, running gambling, prostitution, and bootlegging rackets. He expanded his territory by killing his rivals, most famously in the St. Valentine’s Day Massacre, in which members of the Bugs Moran gang were machine-gunned in a garage on Feb. 14, 1929. In 1931 Capone was convicted for income-tax evasion and sentenced to 1 1 years in prison; eventually he served time in the new Alcatraz prison (see Alcatraz Island). Granted an early release from prison in 1939, in part because he suffered from an advanced stage of syphilis, he died a powerless recluse at his Florida estate.

Caporetto, Battle of (Oct. 24, 1917) Italian military disaster in World War I in which Italian troops retreated before an Austro-German offensive near Trieste on the Isonzo front (see Battles of the Isonzo). More than 600,000 Italian soldiers either deserted or surrendered. The defeat prompted Italy’s allies, France and Britain, to send reinforcements and eventually to establish the Supreme War Council to unify the Allied war

effort.

Capote \k3-'po-te\, Truman orig. Truman Streckfus Persons (b.

Sept. 30, 1924, New Orleans, La., U.S. — d. Aug. 25, 1984, Los Angeles, Calif.) U.S. novelist, short-story writer, and playwright. Capote spent much of his youth in small towns in Louisiana and Alabama. His early works, in the Southern Gothic tradition, include the novels Other Voices, Other Rooms (1948) and The Grass Harp (1951) and the story collection A Tree of Night (1949). His later journalistic style was exemplified in the highly successful “nonfiction novel” In Cold Blood (1966), an account of a multiple murder. Other works include the novella Breakfast at Tiffany ’s (1958; film, 1961), the musical House of Flowers (1954; with Harold Arlen), and the collections The Dogs Bark (1973) and Music for Chameleons (1980).

Capp, Al orig. Alfred Gerald Caplin (b. Sept. 28, 1909, New Haven, Conn., U.S. — d. Nov. 5, 1979, New Haven, Conn.) U.S. cartoonist. He studied landscape architecture before turning to cartooning. His comic strip Li’ l Abner first appeared in the New York Mirror in 1934 and was soon being syndicated throughout the country. Set in the backwoods

community of Dogpatch, U.S. A., it featured Li’l Abner, a shy, awkward woodsman; Daisy Mae, a persistent maiden who succeeded in catching Abner after a 17-year pursuit; and a host of colourful characters.

Cappadocia V.ka-pa-'do-shoV Ancient district, eastern Anatolia. It is a mountainous area located in present-day Turkey; its earliest records date from the 6th century bc, when it was a Persian satrapy. A period of semi-autonomy followed Alexander the Great’s conquest of the Persian empire (330 bc). Important as a Roman ally and client, it was annexed by the emperor Tiberius in ad 17 and made a Roman province. With its command over strategic passes in the Taurus Mountains, the area was a bulwark of the Byzantine Empire until the 11th century. Part of the district was designated a UNESCO World Heritage site in 1985.

Capra, Frank (b. May 18, 1897, near Palermo, Sicily, Italy — d. Sept. 3, 1991, La Quinta, Calif., U.S.) U.S. film director. At age six he immigrated with his family to the U.S. After holding various jobs in the film industry, he emerged as a major director with That Certain Thing (1928) and Platinum Blonde (1931). He won Academy Awards for It Happened One Night (1934) and Mr. Deeds Goes to Town (1936), stories that portray naive idealists who triumph over more worldly types. He chose the same theme for his next film, Mr. Smith Goes to Washington (1939) but departed from his usual style in Lost Horizon (1937) and Meet John Doe (1941). Capra also won a third Academy Award for You Can’t Take It with You (1938). He made the documentary series Why We Fight during World War II and the Christmas classic It’s a Wonderful Life (1946).

Capri Vka-pre, ko-'pre\ Island, southern Italy. Located at the southern entrance to the Bay of Naples, it has an area of 4 sq mi (10 sq km). Cliffs rise in the west to a height of 1,932 ft (589 m). It was a colony of ancient Greece; later it became a favourite resort of Roman emperors. In the Middle Ages it belonged to the abbey of Montecassino and to the republic of Amalfi before passing to the kingdom of Naples. Its rocky shores abound with caves, notably the famous Blue Grotto. Capri is one of Italy’s most popular resorts.

Capricorn or Capricornus (Latin: “Goat horn”) In astronomy, the constellation lying between Aquarius and Sagittarius; in astrology, the tenth sign of the zodiac, governing approximately the period December 22-January 19. It is represented as a goat with what appears to be a fish-tail. One explanation for this odd depiction is that it derives from the Greek myth of Pan. To avoid the monster Typhon, Pan jumped into the water just as he was changing into animal shape. The half of his body above water became a goat, while the submerged half took the shape of a fish. Another relates the form to the Mesopotamian deity Enki (see Ea).

Capricorn, Tropic of See Tropic of Capricorn

Caprivi \ka-'pre-ve\, (Georg) Leo, count von (b. Feb. 24, 1831, Berlin-Charlottenburg, Prussia— d. Feb. 6, 1899, near Crossen-an-der-Oder, Ger.) German soldier and politician. A distinguished soldier, he served as chief of the admiralty (1883-88). He succeeded Otto von Bismarck as Germany’s imperial chancellor (1890-94) and Prussian minister president (1890-92). His achievements included an Anglo-German agreement concerning spheres of influence in Africa, commercial treaties with Austria, Romania, and other states, and the reorganization of the German army.

capsicum See pepper

capstan Mechanical device used chiefly on board ships or in shipyards for moving heavy weights by means of ropes, cables, or chains. A capstan consists of a drum, driven either manually or by steam or electricity, that rotates about a vertical axis to wind in a line wrapped around it. The grip between the line and the drum depends on friction and on the number of times the line is wrapped around the drum. A notched track (ratchet) on the base plate and pawls attached to the drum prevent backward rotation.

capsule In botany, a dry fruit that opens when ripe. It splits from top to bottom into separate segments known as valves, as in the iris, or forms pores at the top (e.g., poppy), or splits around the circumference, with the top falling off (e.g., pigweed and plantain). The spore-forming organ (see sporophyte) of liverworts and mosses is also called a capsule.

Capuchin Vka-pyo-shonX Member of the Order of Friars Minor Capuchin, an autonomous branch of the Franciscans. It began in 1525 as a reform movement led by Matteo da Bascio (c. 1495-1552), who wanted the Franciscans to return to strict observance of the Rule of St. Francis.

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He and his followers wore robes with pointed hoods (Italian, cappuccino), went barefoot, and lived in extreme poverty. Other Franciscans harassed them, and the pope forbade them to extend their membership outside Italy.

The new order was nearly ruined by the defection of their vicar-general, Bernardino Ochino, to Protestantism in 1542, but it later grew quickly, reaching a membership of 17,000 by 1571. It was active in the Counter-Reformation in keeping the common people loyal to Catholicism. An independent order since 1619, they are known for their missionary and social work.

capuchin (monkey) Vka-pyo-shon, ko-'pyii-shonV Any of four species of tropical monkeys (genus Cebus) found from Nicaragua to Paraguay. Considered among the most intelligent New World monkeys, capuchins are named for their cap of crown hair, which resembles the cowl of Capuchin monks. These stocky, round-headed monkeys are 12-22 in. (30-55 cm) long, with a hairy, prehensile tail of about the same length, and are brown or black, sometimes with white markings. Capuchins live in troops, often in the treetops. They eat fruit and small animals and sometimes raid plantations for oranges and other food. Easily trained, they are valued as gentle pets.

capybara \ka-pi-'bar-3\ Semiaquatic rodent {Hydrochoerus hyrdrochaeris) of Central and South America. Classified as the only species in its family, it is related to the cavy and the guinea pig. Capybaras are the largest living rodents, growing as large as 50 in. (1.25 m) long and weighing 110 lbs (50 kg) or more. They are sparsely haired and brownish, with a blunt snout, short legs, small ears, and almost no tail. Capybaras are shy and associate in groups along the banks of lakes and rivers. Herbivorous, they can become pests when they eat cultivated melons, grain, and squash. They swim and dive readily and commonly enter water to elude predators.

caracal Vkar-3-,kal\ Short-tailed cat (Caracal caracal) found in hills, deserts, and plains of Africa, the Middle East, and Central and South Asia. It is sleek and short-haired, with a reddish brown coat and long tufts of black hairs on its pointed ears. Long-legged and short-tailed, it stands 16-18 in. (40^15 cm) tall and is 26-30 in. (66-76 cm) long, excluding its tail. Generally solitary and nocturnal, it preys on birds and mammals, including peafowl, gazelles, and hares. In Asia, where it has become rare, it has been trained as a hunting animal.

Caracalla X.kar-o-'ka-bV officially Marcus Aurelius Severus Antoninus Augustus orig. Septimius Bassianus (b. April 4, ad 188, Lugdunum [Lyon], Gaul — d. April 8, 217, near Carrhae, Mesopotamia) Roman emperor (198-217). He was nicknamed Caracalla for a Gallic cloak he allegedly designed. Until 21 1 he ruled with his father, Septimius Severus, a North African who became emperor in 193. To assure his undisputed rule, Caracalla killed his brother Geta and many of his friends. He built colossal baths in Rome, which still stand. He gave Roman citizenship to all free inhabitants of the empire (212) but showed extreme cruelty toward all who opposed him, and he massacred Germans, Parthians, and Alexandrians. He was murdered by the praetorian prefect. He is regarded as one of Rome’s most bloodthirsty tyrants, and his reign contributed to the empire’s decay.

Caracas \ka-'ra-kas, ko-Ta-kosN City (pop. 2001: 1,836,000), capital of Venezuela. Its Caribbean Sea port is La Guaira. Lying at an elevation of about 3,000 ft (900 m), Caracas is one of the most developed cities in Latin America. It was founded in 1567 by Diego de Losada. It is the birthplace of Simon Bolivar (1783), under whose leadership it became the first colony to revolt against Spain (c. 1810). Caracas has become the country’s primary centre of industry, commerce, education, and culture.

Caramanlis, Constantine See Konstantinos Karamanlis

Caravaggio \ 1 kar-o- , va-jo\ orig. Michelangelo Merisi (b. 1571?, Milan? — d. July 18, 1610, Port'Ercole, Tuscany) Italian painter. He was orphaned at 11. After an apprenticeship in Milan, he went to Rome in 1590, where he won the patronage of a cardinal. A series of large paintings (1599-1603) on the life of St. Matthew established him as the most renowned and controversial painter in Rome of his era. Breaking with conventional formulas used in depicting saints, he used ordinary people as models and painted them with unforgiving realism; his inclination against tradition gave new meaning to the interpretation of traditional themes in religious painting. His use of tenebrism — dramatic, selective illumination of form out of deep shadow to heighten the emotional tension, focus the details, and isolate the figures — became the most outstanding feature of his style and a hallmark of the Baroque period. After c. 1600

he received many commissions, including the monumental The Deposition of Christ (1602-04) and Death of the Virgin (1605-06), which was refused by the Carmelites because of the Virgin's plebeian features, bared legs, and swollen belly.

His reputation and income increased despite harsh criticism and a turbulent lifestyle. He had an enormous impact on painting throughout Europe.

caravan Group of merchants, pilgrims, or travelers journeying together, usually for mutual protection, in deserts or other hostile regions. The camel was the most common means of transport. Caravans have been described since the beginning of recorded history, and they were a major factor in the growth of settlements along their routes. One caravan trail developed into the Silk Road. During the height of caravan travel, which lasted until the 19th century, a single caravan of Muslim pilgrims journeying from Cairo and Damascus to Mecca might employ as many as 10,000 camels.

caravansary \,kar-9-'van-s9-re\ or caravanserai \,kar-3-'van-s9-,ri\ Public building used for sheltering caravans and other travelers in the Middle East. The structure is quadrangular in form and enclosed by a massive wall that has small windows near the top and a few narrow air holes near the bottom. The central court, surrounded by an arcade and storerooms, is usually large enough to contain 300-400 camels. It is open to the sky and has a well with a fountain basin in its center. There are rooms upstairs for lodging.

caraway Dried fruit, commonly called the seed, of Carum carvi, a

biennial herb of the parsley family. Native to Europe and western Asia, it has been cultivated since ancient times. It has a distinctive aroma and a warm, slightly sharp taste. It is used as a seasoning, and the oil is used to flavor alcoholic beverages and as a medicine.

carbamide See urea

carbide Inorganic compound, any of a class of chemical compounds in which carbon is combined with a metal or semimetallic element. The nature of the second element (its position in the periodic table) determines the carbide's type of bonding and its properties. Calcium carbide is useful as a source of acetylene. Carbides of tungsten, silicon (see Carborundum), and boron, called refractory carbides, are extremely hard, remain stable when heated, and have a high melting point and chemical resistance. They are used as abrasives and in cutting tools, as furnace linings, and in other high-temperature applications. Iron carbide (cementite) is an important constituent of steel and cast iron.

carbine Light, short-barreled rifle. The first carbines, from the muzzle-loading muskets of the 18th century to the lever-action repeaters of the 19th, were chiefly cavalry weapons or saddle firearms for mounted frontiersmen. During World War II carbine versions of standard bolt-action or semiautomatic infantry rifles were carried by some officers, artillerymen, and other specialists. Carbine versions of modern assault rifles (such as the Russian AK-47 or the U.S. Ml 6 rifle) are intended for close-quarter fighting, partly replacing the submachine gun. Carbine versions of hunting and target rifles are also made.

carbohydrate Any member of a very abundant and widespread class of natural organic compounds that includes sugars, starch, and cellulose. They are commonly classified as monosaccharides (simple sugars; e.g., glucose, fructose), disaccharides (2-unit sugars; e.g., sucrose, lactose), oligosaccharides (3-10 or so sugars), and polysaccharides (large molecules with up to 10,000 monosaccharide units, including cellulose, starch, and glycogen). Green plants produce carbohydrates by photosynthesis. In most animals, carbohydrates are the quickly accessible reservoir of energy, and oxidation (see oxidation-reduction) of glucose in tissues supplies energy for metabolism. Many (but by no means all) carbohydrates have the gen-

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The Deposition of Christ, oil on canvas
3y Caravaggio, 1 602-04; in the Vati-
:an Museum.

>CALA/ART RESOURCE, NEW YORK

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eral chemical formula C„(H 2 0) n . The carbon (C) atoms are bonded to hydrogen atoms (— H), hydroxyl groups (— OH; see functional group), and carbonyl groups (— C=0), whose combinations, order, and geometric arrangement lead to a large number of isomers with the same chemical formula but different properties. The class is further enlarged because each isomer has various derivatives: uronic acids, sugars with an oxidized group; sugar alcohols, sugars with a reduced group; glycosides, compounds of sugars with other molecules containing a hydroxyl group; and amino sugars, sugars with an amino group (see amino acid).

carbolic acid \kar-'ba-lik\ or phenol Vfe-.nol, 'fe-,n6l\ Organic compound, simplest member of the class of phenols. A colourless liquid with a bland, sweetish odour, it is toxic and caustic. It is a high-volume industrial chemical used chiefly in the manufacture of phenol-formaldehyde resins (see formaldehyde; plastics), epoxy resins, nylon, herbicides, biocides, other synthetic chemicals and pharmaceuticals, and dyes. It is also a solvent and general disinfectant. The phenol coefficient is a number that expresses the germicidal action of a chemical compared with that of phenol.

carbon Nonmetallic chemical element, chemical symbol C, atomic number 6. The usual stable isotope is carbon- 12; carbon- 13, another stable isotope, makes up 1% of natural carbon. Carbon- 14 is the most stable and best known of five radioactive isotopes (see radioactivity); its half-life of approximately 5,730 years makes it useful in carbon- 1 4 dating and radiolabeling of research compounds. Carbon occurs in four known allotropes: diamond, graphite, carbon black (amorphous carbon including coal, coke, and charcoal), and hollow cage molecules called fullerenes. Carbon forms more compounds than all other elements combined; several million carbon compounds are known. Each carbon atom forms four bonds (four single bonds, two single and one double bond, two double bonds, or one single and one triple bond) with up to four other atoms. Multitudes of chain, branched, ring, and three-dimensional structures can occur. The study of these carbon compounds and their properties and reactions is organic chemistry (see organic compound). With hydrogen, oxygen, nitrogen, and a few other elements whose small amounts belie their important roles, carbon forms the compounds that make up all living things: proteins, CARBOHYDRATES, LIPIDS, and NUCLEIC ACIDS. BIOCHEMISTRY is the Study of how those compounds are synthesized and broken down and how they associate with each other in living organisms. Organisms consume carbon and return it to the environment in the carbon cycle. Carbon dioxide, produced when carbon is burned and from biological processes, makes up about 0.03% of the air, and carbon occurs in Earth’s crust as carbonate rocks and the hydrocarbons in coal, petroleum, and natural gas. The oceans contain large amounts of dissolved carbon dioxide and carbonates.

carbon cycle Circulation through nature of carbon in the form of the simple element and its compounds. The source of carbon in living things is carbon dioxide (C0 2) from air or dissolved in water. Algae and green plants (producers) use C0 2 in photosynthesis to make carbohydrates, which in turn are used in the processes of metabolism to make all other compounds in their tissues and those of animals that consume them. The carbon may pass through several levels of herbivores and carnivores (consumers). Animals and, at night, plants return the C0 2 to the atmosphere as a by-product of respiration. The carbon in animal wastes and in the bodies of organisms is released as C0 2 in a series of steps by decay organisms (decomposers),

chiefly bacteria and fungi (see fungus). Some organic carbon (the remains of organisms) has accumulated in Earth's crust in fossil fuels, limestone, and coral. The carbon of fossil fuels, removed from the cycle in prehistoric times, is being returned in vast quantities as C0 2 via industrial and agricultural processes, some accumulating in the oceans as dissolved carbonates and some staying in the atmosphere (see greenhouse effect).

carbon dioxide Inorganic compound, a colourless gas with a faint, sharp odour and a sour taste when dissolved in water, chemical formula C0 2 . Constituting about 0.03% of air by volume, it is produced when carbon-containing materials burn completely, and it is a product of fermentation and animal respiration. Plants use C0 2 in photosynthesis to make carbohydrates. C0 2 in Earth's atmosphere keeps some of the Sun's energy from radiating back into space (see greenhouse effect). In water, C0 2 forms a solution of a weak acid, carbonic acid (H 2 C0 3). The reaction of C0 2 and ammonia is the first step in synthesizing urea. An important industrial material, C0 2 is recovered from sources including flue gases, limekilns, and the process that prepares hydrogen for synthesis of ammonia. It is used as a refrigerant, a chemical intermediate, and an inert atmosphere; in fire extinguishers, foam rubber and plastics, carbonated beverages (see carbonation), and aerosol sprays; in water treatment, welding, and cloud seeding; and for promoting plant growth in greenhouses. Under pressure it becomes a liquid, the form most often used in industry. If the liquid is allowed to expand, it cools and partially freezes to the solid form, dry ice.

carbon- 14 dating or radiocarbon dating Method of determining the age of once-living material, developed by U.S. physicist Willard Libby in 1947. It depends on the decay of the radioactive isotope carbon- 14 (radiocarbon) to nitrogen. All living plants and animals continually take in carbon: green plants absorb it in the form of carbon dioxide from the atmosphere, and it is passed to animals through the food chain. Some of this carbon is radioactive carbon- 14, which slowly decays to the stable isotope nitrogen- 14. When an organism dies it stops taking in carbon, so the amount of carbon- 14 in its tissues steadily decreases. Because carbon- 14 decays at a constant rate, the time since an organism died can be estimated by measuring the amount of radiocarbon in its remains. The method is a useful technique for dating fossils and archaeological specimens from 500 to 50,000 years old and is widely used by geologists, anthropologists, and archaeologists.

carbon monoxide Inorganic compound, a highly toxic, colourless, odourless, flammable gas, chemical formula CO. It is produced when carbon (including coal and coke) or carbon-containing fuel (including petroleum hydrocarbons; e.g., gasoline, fuel oil) does not burn completely to carbon dioxide, because of insufficient oxygen. CO is present in the exhaust gases of internal combustion engines and furnaces. It is toxic because it binds to hemoglobin in blood much more strongly than does oxygen and thus interferes with transport of oxygen from lungs to tissues (see hypoxia; respiration). Symptoms of CO poisoning range from headache, nausea, and syncope to coma, weak pulse, respiratory failure, and death. CO is used industrially as a fuel and in synthesis of numerous organic compounds, including methanol, ethylene, and aldehydes.

carbon steel Alloy of iron and carbon in which the carbon content may range from less than 0.015% to slightly more than 2%. Adding this tiny amount of carbon produces a material that exhibits great strength, hard-

ness, and other valuable mechanical properties. Carbon steels account for about 90% of the world's steel production. They are used extensively for automobile bodies, appliances, machinery, ships, containers, and the structures of buildings. Carbon steel, formerly made by the Bessemer, crucible, or open-hearth process, is now made by the basic oxygen process, or by an arc furnace.

Carbonari \,kar-b3-'na-re\ (Italian dialect: "Charcoal Burners") Members of a secret society (the Carbonaria) in early- 19th-century Italy. Advocating liberal and patriotic ideas, the Carbonari favored constitutional and representative government and aimed to protect Italian interests against foreigners. They helped lead the unsuccessful revolts of 1820 and 1831 and were gradually absorbed into the Young Italy movement. Their influence prepared the way for the Risorgimento.

carbonate Any member of two classes of chemical compounds — one inorganic and the other organic — that are derived from carbon dioxide (C0 2) or its water solution, carbonic acid (H 2 C0 3). Inorganic carbonates (MC0 3 or M 2 C0 3 , where M is a metal atom of, e.g., calcium or sodium) are salts of carbonic acid. The shells and other hard parts of shellfish are calcium carbonate, as is the limestone they turn into. Many other minerals, including calcite, dolomite, and aragonite, consist of or contain carbonates. Sodium carbonate is one of the world's most important basic chemical commodities. Organic carbonates are esters of carbonic acid and various alcohol groups (methyl, ethyl, or phenyl). These are liquids used as solvents and to synthesize plastics and other compounds.

carbonate mineral Any member of a family of minerals that contains the carbonate ion, C0 3 2- , as the basic structural unit. The carbonates are among the most widely distributed minerals in the earth's crust; the most common are calcite, dolomite, and aragonite. Dolomite replaces calcite in limestones; when this replacement is extensive, the rock is called dolomite. Other relatively common carbonate minerals are siderite, rhodochrosite, strontianite (strontium-rich); smithsonite (zinc-rich); witherite (barium-rich); and cerussite (lead-rich).

carbonation Addition of carbon dioxide gas to a beverage, imparting sparkle and a tangy taste and preventing spoilage. The liquid is chilled and cascaded down in an enclosure containing carbon dioxide (either as dry ice or a liquid) under pressure. Increasing pressure and lowering temperature maximize gas absorption. Carbonated beverages do not require PASTEURIZATION.

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Carboniferous Period Interval of geologic time 354-290 million years ago, marked by great changes in world geography. All the landmasses drew closer together as a result of tectonic plate movements. The supercontinent Gondwana occupied much of the Southern Hemisphere. By the end of the period, present-day North America, Greenland, and

northern Europe were also part of Gondwana. Siberia and China (including Southeast Asia) remained individual continents located at high latitudes in the Northern Hemisphere. During this period, swamp forests became widespread, and enormous coal deposits formed. Plants made great advances in the complex forests, and vertebrates were undergoing extensive evolution. Amphibians became widespread and diverse, and reptiles appeared for the first time and rapidly adapted to many habitats.

carbonyl chloride See phosgene

Carborundum V.kar-bo-'ron-domV Trademark name of silicon carbide, an inorganic compound discovered in the 1880s by E.G. Acheson. Carborundum has a crystal structure like that of diamond and is almost as hard. It is used as an abrasive for cutting, grinding, and polishing, as an antislip additive, and as a refractory.

carboxylic acid \,kar-bak-'si-lik\ Any organic compound with the general chemical formula — COOH in which a carbon (C) atom is bonded to an oxygen (O) atom by a double bond to make a carbonyl group (— C=0; see functional group) and to a hydroxyl group (—OH) by a single bond (see bonding). The fourth bond on the carbon links it to a hydrogen (H) atom (for formic acid), a methyl (— CH 3) group (for acetic acid), or another natural or synthetic monovalent group. Carboxylic acids occur widely in nature. In fatty acids, the fourth group is a hydrocarbon chain. In aromatic acids (see aromatic compound), it is a ring-structured hydrocarbon. In amino acids, it contains a nitrogen atom. Carboxylic acids participate in chemical reactions as acids, usually fairly weak. Many carboxylic acids (acetic acid, citric acid, lactic acid) are intermediates in metabolism and can be found in natural products; others (e.g., salicylic acid) are used as solvents and to prepare many chemical compounds. Important carboxylic-acid derivatives include esters, anhydrides, amides, halides (see halogen), and salts (see soap).

carburetor Vkar-bo-.ra-torX Device for supplying a spark-ignition engine with a mixture of fuel and air. Carburetors are used in small gasoline engines, such as lawn mowers and chainsaws. Once an essential component in all gasoline engines, automobile carburetors were displaced by electronic fuel injection systems from the late 1970s through 1990. Carburetors for automobile engines usually contained a storage chamber for liquid fuel, a choke, an idling jet, a main jet, an airflow restriction, and an accelerator pump. The quantity of fuel in the storage chamber was controlled by a valve actuated by a float. The choke, a butterfly valve, reduced the intake of air so that a fuel-rich charge was drawn into the cylinders when a cold engine was started. As the engine warmed up, the choke was gradually opened. Reduced pressure near the partially closed throttle valve caused the fuel to flow from the idling jet into the intake air. Further opening the throttle valve activated the main fuel jet. Then the venturi-shaped airflow restriction created reduced pressure, drawing fuel from the main jet into the airstream at a rate related to the airflow so that a nearly constant fuel-air ratio was obtained. The accelerator pump injected fuel into the inlet air when the throttle was opened suddenly. See also GASOLINE ENGINE; VENTURI TUBE.

carburizing Oldest method for surface-hardening steel, by heat or mechanical means to increase the hardness of the outer surface while leaving the core relatively soft. The combination of hard surface and soft interior withstands very high stress and fatigue, and also offers low cost and superior flexibility in manufacturing. To carburize, the steel parts are

placed in a carbonaceous environment (with charcoal, coke, and carbonates, or with carbon dioxide, carbon monoxide, methane, or propane) at a high temperature for several hours. The carbon diffuses into the surface of the steel, altering the crystal structure of the metal. Gears, ball and roller bearings, and piston pins are often carburized.

Carcassonne \,kar-ka-'s6n\ ancient Carcaso City (pop., 1999: 43,950), southwestern France. Situated on the Aude River, it was occupied by the Iberians in the 5th century bc and later by Gallo-Romans. Muslims took it in ad 728. The French soldier Simon de Montfort captured it c. 1209, and in 1247 it was united with the French crown. It was burned by Edward the Black Prince in 1355 when he failed to take the citadel. A 13th-century church and cathedral survive, as do remains of medieval fortifications, the last of which were designated a World Heritage site in 1997. The city’s main economic activities are tourism and retailing.

Carchemish Vkar-ko-.mishV Ancient city-state, western bank of the Euphrates River. Its remains lay southeast of Gaziantep, Tur., near the Syrian border. It was a city of the Mitanni kingdom in the 2nd millennium bc and later a chief Hittite city. Probably subjugated by Sea Peoples after c. 1200 bc, it gradually came under Assyrian rule, finally capitulating in 717 bc. In a battle at Carchemish in 605 bc, Babylonian king Nebuchadrezzar II expelled the Egyptians from Syria. The ruins were excavated in 1911-20.

carcinogen Vkar-'si-no-jonX Agent that can cause cancer. Exposure to one or more carcinogens, including certain chemicals, radiation, and certain viruses, can initiate cancer under conditions not completely understood. Some people have a genetic tendency to develop cancer when exposed to a specific carcinogen or combination of carcinogens. Repeated local injury or irritation to a part of the body can be carcinogenic. Identifying and eliminating carcinogens in time can reduce the incidence of cancer.

cardamom Vkar-do-moirA Spice consisting of whole or ground dried fruit, or seeds, of Elettaria cardamomum, a perennial herb of the ginger family. The flavour is warm, slightly pungent, and highly aromatic. Cardamom is a popular seasoning. Native to moist forests of southern India, the fruit may be collected from wild plants, but most is cultivated. The whole fruit is a green, three-sided oval capsule containing 15-20 dark, hard, angular seeds.

Cardenas, Bartolome de See Bartolome Bermejo

Cardenas \'kar-d 3 n-,as\ (del Rio), Lazaro (b. May 21, 1895, Jiquilpan, Mex. — d. Oct. 19, 1970, Mexico City) President of Mexico (1934-40). Of Indian descent, he joined the armed struggle against the dictatorial Victoriano Huerta, rising through the ranks of the revolutionary forces. His faction triumphed, and Cardenas was made a general in the Mexican army in 1920. In 1928 he became governor of Michoacan, and in 1934 he became president. Noted for his efforts to carry out the social and economic aims of the revolution, he distributed a record amount of land to peasants, made loans available to them, organized workers’ and peasants’ confederations, and nationalized the oil industry, the principal railways, and other foreign-owned industries. He opposed U.S. influence in Mexico and later supported Fidel Castro. For many Mexicans he remains the fore-

most symbol of the political left. His son Cuauhtemoc, a prominent leader of the opposition to Mexico's ruling party, is widely believed to have been denied victory in the 1988 presidential elections by fraud; he has since served as mayor of Mexico City. See also Indigenismo.

Cardiff City and county (pop., 2001: 305,340), capital of Wales. It is located on the Bristol Channel in southeastern Wales. The Romans built a fort there c. ad 75. The town itself was established with the arrival of the Normans in the 11th century. Its population was small into the early 19th century, but by the early 20th century Cardiff had become the largest coal-exporting port in the world. The coal trade ceased in the 1960s, but Cardiff remains the largest city and the principal commercial centre of Wales.

Cardigan, James Thomas Brudenell, 7th earl of (b. Oct. 16, 1797, Hambleden, Buckinghamshire, Eng. — d. March 27/28, 1868, Deene Park, Northamptonshire) British general. After entering the army (1824), he purchased promotions to become a lieutenant colonel (1832) and gained a reputation as a martinet. He spent his inherited wealth to make his regiment the best-dressed in the service (introducing the later-named cardigan jacket). At the outbreak of the Crimean War (1853), he was appointed commander of the Light Brigade of British cavalry, which he led in the ill-fated charge at the Battle of Balaklava. Despite the disaster, Cardigan was lionized on his return to England and appointed inspector general of cavalry.

Cardigan Bay Bay, western Wales. A widemouthed inlet of St. George's Channel, it is about 65 mi (105 km) long. Two national parks, Snowdonia and Pembrokeshire Coast, incorporate substantial stretches of shoreline. Many resort towns line the bay, including Aberystwyth and Fish-guard, a base for ferry service between Wales and Ireland.

Cardin \kar-'da n \, Pierre (b. July 7, 1922, Venice, Italy) French fash-ion designer. At age 17 he went to Vichy to become a tailor at a men's shop. After World War II he joined the Parisian fashion house of Paquin

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and designed the costumes for Jean Cocteau's film Beauty and the Beast (1945). In 1959 he created the first ready-to-wear collection for women ever presented by a top designer and in 1960 introduced the first designer ready-to-wear collection for men. He showed himself a master of the bias cut, soft semifitted lines, and lavish colour. In the late 1960s his stark, short tunics, and his use of vinyl, helmets, and goggles launched the Space Age look. His men's clothing influenced other designers, including Bill Blass.

cardinal Member of the Sacred College of Cardinals. The cardinals' duties include electing the pope, acting as his principal counselors, and aiding in the governance of the Roman Catholic Church. Cardinals serve as officers of the Roman Curia, bishops of major dioceses, and papal envoys.

Since 769 only cardinals have been eligible to become pope, and since 1059 the pope has been elected only by cardinals. The first cardinals were the deacons of the seven regions of Rome. Their present-day successors are known as cardinal deacons. Cardinal bishops are the successors of the bishops of the sees just outside Rome and of the patriarchal sees of the Eastern Catholic Church. Cardinal priests are the bishops of important sees around the world and constitute the most numerous order of cardinals. The number of cardinals was limited to 70 for nearly 400 years until 1958, when John XXIII (1958-63) eliminated the restriction. Under Paul VI (1963-78) there were 145 cardinals, and under John Paul II (1978–2005) there were 182. With the increase in the size of the cardinalate came new restrictions imposed by the popes. Paul VI directed that cardinals who do not resign by age 75 relinquish the right to vote for a pope when they reach 80. He also limited the number of voting cardinals to 120, a restriction confirmed during the pontificate of John Paul II. A red biretta and ring are symbolic of the office.

cardinal or redbird Songbird (Cardinalis cardinalis, family Fringillidae or Emberizidae) of North America, primarily east of the Rocky Mountains. It is 8 in. (20 cm) long and has a pointed crest. The male is bright red, the female a duller red or olive-brown. Pairs of cardinals utter loud, clear whistling notes year-round in gardens and open woodlands. They feed on insects, wild seeds, and fruits. Cardinals are especially abundant in the southeastern U.S. and have been introduced into Hawaii, southern California, and Bermuda. Related species also called cardinals live in South America.

cardinal flower Any of several closely related species of the genus Lobelia, perennial plants of the lobelia family, native to North and Central America. All bear spikes of scarlet, lipped flowers on leafy stems up to 5 ft (1.5 m) tall. L. cardinalis and L. splendens, considered to be one species by some authorities, are taller than L. fulgens, the Central American parent species of the garden cardinal flower. The blue cardinal (L. siphilitica) is smaller than the others and has blue or whitish flowers.

carding In yarn production, a process of separating individual fibres, causing many of them to lie parallel and removing most of the remaining impurities. Cotton, wool, waste silk, and man-made staple are subjected to carding. Carding produces a thin sheet of uniform thickness that is then condensed to form a thick, continuous, untwisted strand called sliver. When very fine yarns are desired, carding is followed by combing, a process that removes short fibres, leaving a sliver composed entirely of long fibres, all laid parallel and smoother and more lustrous than uncombed types. Carded and combed sliver is then spun.

carding machine Machine for carding textile fibres. In the 18th century, hand carding was laborious and constituted a bottleneck in the newly mechanized production of textiles. Several inventors worked to develop machines to perform the task, notably John Kay, Oliver Evans, Lewis Paul, R. Arkwright, and Johann Bodmer.

cardiology Medical specialty dealing with heart diseases and disorders. It began with the 1749 publication by Jean Baptiste de Senac of contemporary knowledge of the heart. Diagnostic methods improved in the 19th century, and in 1905 the electrocardiograph was invented. The 20th century saw many surgical advances in cardiology, including heart transplants and the use of artificial hearts. Current diagnostic methods include chest

percussion (tapping) and auscultation, electrocardiography, and echocardiography (see ultrasound). Cardiologists provide continuing care of heart patients, doing basic heart-function studies, supervising therapy, including drug therapy, and working closely with heart surgeons.

cardiopulmonary resuscitation (CPR) Emergency procedure to restore breathing and circulation in an unconscious person. A trained rescuer opens the airway and confirms the absence of breathing and pulse. Resuscitation itself consists of alternating mouth-to-mouth breathing (see artificial respiration) and repeated pressure on the chest to circulate the blood.

cardiovascular system System of vessels that convey blood to and from tissues throughout the body, bringing nutrients and oxygen and removing wastes and carbon dioxide. It is essentially a long, closed tube through which blood moves in a double circuit — one through the lungs (pulmonary circulation) and one through the rest of the body (systemic circulation). The heart pumps blood through the arteries, which branch into smaller arterioles, which feed into microscopic capillaries (see artery; capillary). These converge to form small venules, which join to become larger veins, generally following the same path as the arteries back to the heart. Cardiovascular diseases include atherosclerosis, congenital and rheumatic heart disease, and vascular inflammation.

Cardoso, Fernando Henrique (b. June 18, 1931, Rio de Janeiro, Braz.) President of Brazil (1995-2003). Born into a wealthy military family, he taught sociology at the University of Sao Paulo and was a prominent member of the left-wing intellectual opposition when Brazil was under military rule, though he turned more centrist after civilian rule was restored. In 1993 he became finance minister and supervised the creation of the Real Plan, an effective anti-inflation package that helped him gain the presidency in 1994. He worked for privatization of state-owned companies and increased foreign investment. In 1998 he became the first president in Brazilian history to be reelected. A foreign-exchange crisis in 1999 damaged Brazil’s growth prospects.

Cardozo, Benjamin (Nathan) (b. May 24, 1870, New York, N.Y., U.S. — d. July 9, 1938, Port Chester)

U.S. jurist. Born into a distinguished Jewish family, he was admitted to the New York bar in 1891 and became a successful courtroom lawyer.

Elected to the state Supreme Court as a reform candidate (1913), he was quickly promoted to the Court of Appeals. During his tenure many thought the quality of the appellate bench exceeded that of the U.S.

Supreme Court. He influenced the trend in U.S. appellate judging toward greater involvement in public policy and consequent modernization of legal principles. He was both a creative common-law judge and a notable legal essayist.

Appointed to the Supreme Court of the United States in 1932, he usually voted with liberals Louis Brandeis and Harlan Fiske Stone. He wrote the majority opinion upholding the constitutionality of the Social Security Act (1937). In a 1937 case on double jeopardy, he held that the states were not required to implement all the provisions of the Bill of Rights, a position that became known as “selective incorporation.” He served on the Supreme Court until 1938. The law school at Yeshiva University is named for him.

cards, playing See playing cards

Carducci \kar-'du-che\, Giosue (b. July 27, 1835, Val di Castello, near Lucca, Tuscany — d. Feb. 16, 1907, Bologna, Italy) Italian poet. He taught literary history in Bologna for 40 years and in later years served as a senator. He opposed the prevailing Romanticism and advocated a return to classical models of prosody, but his rhetorical tirades provoked resistance to reform. His best volumes of verse, The New Lyrics and The Barbarian Odes (1887), contain evocations of landscape, memories of childhood, and representations of the glory of ancient Rome. Regarded in his time as Italy’s national poet, he won the Nobel Prize for Literature in 1906.

Benjamin Cardozo.

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Careme \ka-'rem\, Marie-Antoine (b. June 8, 1784, Paris, Fr. — d. Jan. 12, 1833, Paris) French chef. Born into a poor family, he attained employment in a pastry shop frequented by Charles-Maurice de Talleyrand. He served as Talleyrand’s chef for 12 years and subsequently created grandiose dishes and elaborately sculpted confections for the most splendid households of Europe, including those of the young George IV, Tsar Alexander I, and the baron de Rothschild. He wrote several classics of grande cuisine.

Carew, Rod in full Rodney Cline Carew (b. Oct. 1, 1945, Gatun, Pan.) Panamanian-born U.S. baseball player. Carew moved from Panama to New York City in 1962, where he learned sandlot ball. Playing for the Minnesota Twins (1967-78), he became one of the great hitters of the modern era and led the American League in batting seven times between 1969 and 1978. His highest average was .388, in 1977. He was traded in 1979 to the California (later Anaheim) Angels and retired in 1986 with a lifetime batting average of .328.

Carey, Peter (Philip) (b. May 7, 1943, Bacchus Marsh, Vic., Austl.) Australian writer. He worked as an advertising copywriter and at other odd jobs until 1988, when he became a full-time writer. His short-story collection The Fat Man in History (1974) contains macabre elements. His novels, more realistic but laced with black humour, include Bliss (1981), Illywhacker (1985), Oscar and Lucinda (1988, Booker Prize), The Unusual Life of Tristan Smith (1994), Jack Maggs (1997), and True History of the Kelly Gang (2000; Booker Prize, 2001).

cargo cult Any religious movement based on the observation by local residents of the delivery of supplies by ship and aircraft to colonial officials. Cargo cults were observed chiefly in Melanesia in the late 19th and early 20th centuries. They were characterized by the expectation of a new age of blessing and prosperity to be initiated by the arrival of a special “cargo” of goods from supernatural sources. Such beliefs may have expressed traditional millennial ideas, often revived by the teaching of Christian missions.

Caria \'kar-e-o\ Ancient district, southern Anatolia. It was one of the most thoroughly Hellenized districts in ancient Anatolia; its territory included Greek cities along the shore of the Aegean Sea and a mountainous interior bounded by Lydia, Phrygia, and Lycia. Absorbed first by Lydia, it later was annexed (4th century bc) by the Persian Achaemenian Empire, one of whose governors, Mausolus, transferred its capital from Mylasa to Halicarnassus. Taken from Persia in 334 bc by Alexander the Great, it was incorporated into the Roman province of Asia in 129 bc.

Carib Vkar-ob\ American Indian people who inhabited the Lesser Antilles and parts of the South American coast at the time of the Spanish conquest. The Island Carib (now extinct) were a warlike, individualistic people who reportedly practiced cannibalism (the term derives from their name). Carib groups on the mainland, some of whom still survive, lived in the Guianas and as far south as the Amazon River; they subsisted by hunting and growing crops and were less aggressive than their island relatives.

Cariban Vkar-e-bonX languages Large family of South American Indian languages. It has an estimated 43 members; nearly half are now extinct, and most of the remainder have very few speakers. Most Cariban languages are spoken in southern Venezuela, the Guianas, and Brazil north of the Amazon, though several have strayed far from this area. Cariban incursions into the mainly ARAWAKAN-speaking Antilles at the time of Columbus provided European languages with the words Carib (hence, Caribbean) and cannibal, both perhaps from a proto-Cariban form meaning “Indian, person.”

Caribbean Sea Arm of the Atlantic Ocean. It covers about 1,049,500 sq mi (2,7 18,200 sq km) and washes the northern coast of South America, eastern Central America, and eastern Mexico. It reaches its greatest known depth, about 25,000 ft (7,500 m), in Cayman Trench, between Cuba and

Jamaica. Its generally tropical climate varies, depending on mountain elevations, water currents, and trade winds. The economies of its island countries, including Saint Kitts and Nevis, Dominica, Saint Lucia, and Barbados, are greatly dependent on tourism; the region is one of the world’s principal winter resort areas. See map on opposite page.

caribe See piranha

caribou Vkar-o-.biiX Arctic deer (Rangifer tarandus) of the tundra, taiga, and forests, native to North America and northern Eurasia from Scandinavia to eastern Siberia. Both sexes have antlers. Caribou stand 2.3 — 4.6

ft (0.7-1. 4 m) tall at the shoulder and weigh up to 660 lbs (300 kg); domesticated races are about the size of donkeys. They are usually grayish or brownish with lighter underparts but may be whitish or nearly black. Their herds are famous for their seasonal migration between summer and winter ranges. Their staple winter food is a lichen, popularly called reindeer moss, which they reach by scraping the snow away with their feet. In summer they also eat grasses and saplings. See also reindeer.

caricature Vkar-i-ko-.chuA Comically distorted drawing or likeness intended to satirize or ridicule its subject. The word, derived from the Italian caricare (“to load or charge”), was probably coined by the Carracci family, who defended the practice as a counterpart to idealization. In the 18th century the caricature became connected with journalism and was put to virulent use by political commentators. In the 1880s photo-process engraving made it possible to produce and illustrate daily newpapers cheaply, bringing caricatures to the general public. In the 20th century caricature increasingly moved into the editorial, sports, and theatrical sections of newspapers. Important caricaturists include Jacques Callot, George Cruikshank, Honore Daumier, Gustave Dore, and Al Hirschfeld.

caries \'kar-ez\ or tooth decay Localized disease that causes decay and cavities in teeth. It begins at the tooth’s surface and may penetrate the dentin and the pulp cavity. Microorganisms in the mouth are believed to consume sugars and produce acids that eat away at tooth enamel. The dentin’s protein structure is then destroyed by enzymes. Diet, general health, structural tooth defects, and heredity affect the risk of having caries. Prevention involves avoiding excessive sweets, brushing and flossing the teeth, and having regular dental care. Treatment includes restoration of teeth with cavities. Fluoridation of water can reduce the occurrence of caries by as much as 65%.

carillon \'kar-3-,lan\ Musical instrument consisting of at least 23 cast bronze bells tuned in chromatic order. Usually located in a tower, it is played from a keyboard. Most carillons encompass three to four octaves. The carillon originated in Flanders c. 1480, and the art of carillon building reached its height in the Netherlands in the 17th century, when the tuning of the bells became highly refined.

Carillon clavier

GILLETT & JOHNSTON (CROYDON) LIMITED

Carinthia See Karnten

Carissimi \ka-'res-se-me\, Giacomo (baptized April 18, 1605, Marino, near Rome — d. Jan. 12, 1674, Rome) Italian composer. He worked as maestro di cappella at the Collegio Germanico in Rome, a musically important post at a notable Jesuit institution, from 1629 until

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his death. His approximately 15 oratorios (performed in place of operas during Lent), including Baltazar, Ezechia, Jephte, Jonas , and Judicium extremum made him the principal oratorio composer of the mid- 17th century. He also wrote some 150 cantatas and nearly 100 motets.

Carl XVI Gustaf Swedish Carl Gustaf Folke Hubertus (b. April 30, 1946, Stockholm, Swed.) King of Sweden from 1973. Grandson of King Gustav VI Adolf (1882-1973), he became crown prince in 1950, his

father having died in 1947. After studying at military schools, he became a naval officer. His accession occurred at a time when the role of the Swedish monarchy was being radically altered; the new constitutional laws of 1973 left the king with a solely symbolic function rather than a formal role in the country’s administration.

Carleton, Guy See Guy Carleton, 1st Baron Dorchester

Carleton Vkar-ol-tonN College Private liberal arts college in Northfield, Minn., founded in 1866. It offers a variety of undergraduate majors. Small classes and opportunities to participate in faculty research projects attract a select student body, most from out of state. The academic year is based on three 10- week trimesters, with each student typically enrolling in three courses per trimester.

Carlisle \kar-'lll\ City, administrative district (pop., 2001: 100,734), and seat of the administrative county of Cumbria, northwestern England. It was founded as Luguvallium by the Romans on the River Eden opposite a fortified camp on the line of Hadrian's Wall. Destroyed by Norse invaders c. 875, it was restored when claimed from the Scots by William II in 1092. Mary, Queen of Scots, was imprisoned there in 1568. It was besieged during the English Civil Wars, and its Royalist defenders eventually surrendered to Parliamentary forces in 1645. Its cotton textile industry grew in the 1 8th— 19th centuries, and it has remained the centre of northern England’s cotton industry.

Carlism Spanish political movement of traditionalist character that originated in the 1820s. Carlists supported the claims of Ferdinand VII’ s brother Don Carlos (1788-1855) and his descendants to the throne, rejecting the succession of Ferdinand’s daughter Isabella II by invoking the Salic Law (introduced into Spain in 1713), which excluded females from the royal succession. The disputed succession led to several unsuccessful civil rebellions, known as the Carlist Wars (1833-39, 1872-76). Later adherents of Carlism formed the Traditionalist Party (1918), which merged with the Faiange in 1937.

Carlowitz \ , kar-b-,vits\ / Treaty of (1699) Peace settlement that ended hostilities (1683-99) between the Ottoman Empire and the Holy League (Austria, Poland, Venice, and Russia). Signed at Carlowitz (now Sremski Karlovci), near Belgrade, it significantly diminished Turkish influence in eastern Europe and made Austria the dominant power there. Austria received most of Hungary, Transylvania, Croatia, and Slovenia. Venice acquired most of Dalmatia, and Poland regained Podolia and part of Ukraine. The Russians concluded a two-year armistice at Carlowitz, signing a treaty in 1700 that gave Azov to Russia, though the Turks regained Azov in 1711.

Carlsbad See Karlovy Vary

Carlsbad Caverns National Park Preserve, southeastern New Mexico, U.S. Established as a national monument in 1923 and as a national park in 1930, it covers 73 sq mi (189 sq km). Beneath the surface winds a maze of underground chambers; one of the largest caverns ever discovered, the Big Room, is about 2,000 ft (600 m) long and 1,100 ft (330 m) wide, and its ceiling arches 255 ft (78 m) above the floor. In the summer a colony of bats inhabits a part of the caverns known as Bat Cave.

Carlsbad Decrees (Aug. 6-31, 1819) Resolutions issued by German leaders to suppress liberal and nationalistic tendencies. Meeting at Carlsbad, Bohemia (now Karlovy Vary, Cz.Rep.), the conference of ministers

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from the major German states agreed to Prince von Metternich's proposals advocating censorship, the disbanding of the Burschenschaft groups, and the creation of a commission to ferret out conspiratorial organizations. In the long run, the repressive decrees failed to stifle German nationalism or liberal developments.

Carlsson, Arvid (b. Jan. 25, 1923, Uppsala, Swed.) Swedish pharmacologist. He received his M.D. from the University of Lund. Carlsson established that dopamine is an important neurotransmitter, showing that high levels of dopamine are found in areas of the brain that control walking and other voluntary movements. He determined that levodopa, a substance that the brain uses to make dopamine, could be employed as a treatment for parkinsonism. His work also contributed to an understanding of the relationship between neurotransmitters and mental states such as clinical depression, which led to new antidepressant drugs, including Prozac. Along with Eric Kandel and Paul Greengard, Carlsson was awarded the Nobel Prize in 2000.

Carlton, Steve in full Steven Norman Carlton (b. Dec. 22, 1944, Miami, Fla., U.S.) U.S. baseball pitcher. Carlton pitched in junior college before signing with the St. Louis Cardinals in 1965. A left-handed pitcher, he won 20 or more games in a single season six times and was a four-time Cy Young Award winner for best pitcher. He played for the Cardinals (1966-70), the Philadelphia Phillies (1971-83), and several other teams. His career total of 4,136 strikeouts is second only to that of Nolan Ryan.

Carlyle, Thomas (b. Dec. 4, 1795, Ecclefechan, Dumfriesshire, Scot. — d. Feb. 5, 1881, London,

Eng.) Scottish historian and essayist.

The son of a mason, Carlyle was reared in a strict Calvinist household and educated at the University of Edinburgh. He moved to London in 1834. An energetic, irritable, fiercely independent idealist, he became a leading moral force in Victorian literature. His humorous essay "Sartor Resartus" (1 836) is a fantastic hodgepodge of autobiography and German philosophy. The French Revolution,

3 vol. (1837), perhaps his greatest achievement, contains outstanding set pieces and character studies. On Heroes, Hero-Worship, and the Heroic in History (1841) showed his reverence for strength, particularly when combined with the conviction of a God-given mission. He later published a study of Oliver Cromwell (1845) and a huge biography of Frederick the Great, 6 vol. (1858-65).

Carmarthen Vkor-'mar-thonV Town (pop., 2001: 13,130), administrative centre of the county of Carmarthenshire, southern Wales. It lies on the Afon Tywi above the mouth of the Bristol Channel. Both the Romans and Normans built strongholds there. An Augustinian priory dating from the Norman period once housed the Black Book of Carmarthen (c. 1250), which is the oldest Welsh manuscript extant.

Carmelite Mendicant order of the Roman Catholic church. It originated c. 1155 on Mount Carmel in Palestine, where a number of former pilgrims and crusaders began to live as hermits. Their rule was written by St. Albert, Latin patriarch of Jerusalem, and approved by Pope Honorius III in 1226. As Muslim incursions made Palestine increasingly unsafe, the Carmelites scattered to Cyprus, Sicily, France, and England. In England and Western Europe the order transformed itself from a group of hermits into one of mendicant friars. The first institution of Carmelite nuns was founded in 1452. St. Teresa of Avila and St. John of the Cross reemphasized the strictness and austerity of Carmelite traditions, establishing Discalced (barefoot) Carmelite orders in 1562 and 1569, which gave rise to an independent order in 1593. Both the reformed and the original orders suffered greatly during the French Revolution and the Napoleonic era, but they were later restored in most of Western Europe as well as in the Middle East, Latin America, and the U.S.

Carmichael, Hoagy orig. Hoagland Howard Carmichael (b.

Nov. 22, 1899, Bloomington, Ind., U.S. — d. Dec. 27, 1981, Rancho

Mirage, Calif.) U.S. songwriter. While studying law in Indiana, he met many jazz musicians, including Bix Beiderbecke, who recorded Carmichael's first composition, "Riverboat Shuffle" (1924). The relaxed tunefulness of later songs such as "Georgia (Georgia on My Mind)," "Rockin' Chair," and "Lazy River" gave them a universal appeal. For Hollywood films he wrote "Thanks for the Memory," "Two Sleepy People," "Heart and Soul," and "In the Cool, Cool, Cool of the Evening" (1951, Academy Award). His "Stardust" is reputedly the most recorded popular song of all time. He acted in several films, including To Have and Have Not (1944) and Young Man with a Horn (1950), and wrote the memoirs The Stardust Road (1946) and Sometimes I Wonder (1965).

Carmona \kar-'m6-n3\, Antonio Oscar de Fragoso (b. Nov. 24, 1869, Lisbon, Port. — d. April 18, 1951, Lisbon) Portuguese general and politician. A career officer, he rose to the rank of general by 1922. He took part in the army coup of May 1926 and became premier later that year. He ruled as a virtual dictator before calling for a plebiscite; elected

president, he served from 1928 to 1951, acting as a symbol of political continuity after he named Antonio de Oliveira Salazar premier in 1932.

Carnap, Rudolf (b. May 18, 1891, Ronsdorf, Ger. — d. Sept. 14, 1970, Santa Monica, Calif., U.S.) German-born U.S. philosopher. He earned a doctorate in physics at the University of Jena in 1921. In 1926 he was invited to join the faculty of the University of Vienna, where he soon became an influential member of a group of philosophers, mathematicians, and scientists known as the Vienna Circle. Out of their discussions developed the basic ideas of logical positivism. Carnap immigrated to the U.S. in 1935 and taught at the University of Chicago (1936-52). After two years at the Institute for Advanced Study at Princeton (1952-54), he joined the faculty of the University of California at Los Angeles, where he remained until his death. Carnap sought to give the basic thesis of empiricism — that all concepts and beliefs about the world ultimately derive from immediate experience — a precise interpretation, construing it as a logical thesis about the evidential grounding of empirical knowledge. For Carnap, empiricism is the doctrine that the terms and sentences that express assertions about the world are “reducible” in a clearly specifiable sense to terms and sentences describing the immediate data of experience. His major works include The Logical Structure of the World (1928), The Logical Syntax of Language (1934), Introduction to Semantics (1942), Meaning and Necessity (1947), and The Logical Foundations of Probability (1950).

carnation Herbaceous plant (. Dianthus caryophyllus) of the pink family, native to the Mediterranean, widely cultivated for its fringe-petaled, often spicy-smelling flowers. Border, or garden, carnations include a range of varieties and hybrids. The perpetual flowering carnation, taller and stouter, produces larger flowers and blooms almost continuously in the greenhouse; miniature (baby) and spray varieties are also grown for the florist trade. Carnations are among the most popular cut flowers, used in floral arrangements, corsages, and boutonnieres.

carnauba wax Very hard wax obtained from fronds of the carnauba tree, Copernicia cerifera, a fan palm of Brazil. During the regular dry seasons in Brazil, where it is called the tree of life, the carnauba palm protects its fanlike fronds from loss of moisture by secreting a coat of carnauba wax. Carnauba has been used in high-gloss polishes, phonograph records, and explosives. Synthetics have replaced it for many applications.

Carne \kar-'na\, Marcel (b. Aug. 18, 1906, Paris, France — d. Oct. 31, 1996, Clamart) French film director. He worked as an assistant director before directing his first feature, Jenny (1936). This success was followed by Bizarre, Bizarre (1937), Port of Shadows (1938), and Daybreak (1939), works of poetic realism that were the fruit of his collaboration with screenwriter Jacques Prevert. During the Nazi occupation he made The Devil’s Envoys (1942) and later his masteipiece, The Children of Paradise (1945), which chronicled life in the theatre and celebrated the French spirit. His work declined after his breakup with Prevert in 1948.

Carnegie Hall Concert hall in New York, N.Y., U.S. It was endowed by the industrialist Andrew Carnegie at the insistence of the conductor Walter Damrosch (1862-1950). Designed in a Neo-Italian Renaissance style by William Burnet Tuthill, it opened in 1891, with Pyotr Tchaikovsky as guest of honour. Threatened by destruction in the late 1950s, it was saved by a public outcry and purchased by the city. It was extensively renovated in 1982-86. Admired for its beauty and its superb acoustics, it

seats almost 2,800 people and has long been the most famous concert hall in the U.S.

Carlyle, detail of an oil painting by G.F. Watts, 1877; in the National Portrait Gallery, London

COURTESY OF THE NATIONAL PORTRAIT GALLERY, LONDON

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Carnegie Mellon University Private university in Pittsburgh, Pennsylvania, U.S. It was formed in 1967 through the merger of the Carnegie Institute of Technology (created in 1900 through a gift from Andrew Carnegie) and the Mellon Institute of Industrial Research (founded in 1913 through a gift from Andrew W. Mellon). It comprises schools of technology, science, computer science, humanities and social sciences, fine arts, public policy, and industrial administration. It has built a reputation as an arts centre, operating three galleries, two concert halls, and two theatres.

Carnegie \kar-'ne-ge, 'kar-no-geX, Andrew (b. Nov. 25, 1835, Dunfermline, Fife, Scot. — d. Aug. 11,

1919, Lenox, Mass., U.S.) U.S. industrialist and philanthropist. The son of a Scottish weaver, he emigrated to the U.S. with his family in 1848. A job in a telegraph office led to his early career with the Pennsylvania Railroad Co., and his canny investments made him wealthy by age 30. In 1872-73 he founded the steelworks near Pittsburgh, Pa., that evolved into the Carnegie Steel Co. in 1889. By adopting technological innovations such as the open-hearth furnace and by increasing efficiency through vertical integration, Carnegie built a vast enterprise that dominated the U.S. steel industry. In 1901 he sold his company to J.P. Morgan, and it became part of U.S. Steel. Andrew Carnegie Believing that the affluent were brown brothers obliged to use their surplus wealth

for the improvement of mankind, Carnegie retired to devote himself to philanthropy, giving hundreds of millions of dollars to libraries and uni-

versities, including Carnegie Mellon University, and endowing such organizations as the Carnegie Institute of Pittsburgh and the Carnegie Corp. of New York, the largest of all his foundations.

Carnegie, Dale orig. Dale Carnegey (b. Nov. 24, 1888, Maryville, Mo., U.S. — d. Nov. 1, 1955, Forest Hills, N.Y.) U.S. lecturer and author. Born into poverty, he worked as a traveling salesman and an actor before he began teaching public speaking at a YMCA in New York City in 1912. His classes were extremely successful, and he was soon lecturing to packed houses. To standardize his teaching methods he began publishing pamphlets, which he collected into book form as Public Speaking: A Practical Course for Business Men (1926). His hugely popular How To Win Friends and Influence People (1936) won him a national following; like most of his books, it reveals little that was unknown about human psychology but stresses that an individual's attitude is crucial. The Dale Carnegie Institute subsequently established hundreds of chapters throughout the country.

cornelian \kar-'ne-le-on\ or cornelian Translucent, semiprecious variety of the silica mineral chalcedony that owes its red to reddish brown colour to the incorporation of small amounts of iron oxide. A closely related variety of chalcedony, sard, differs only in the shade of red. Carnelian was highly valued and used in rings and signets by the Greeks and Romans, some of whose intaglios have retained their high polish better than those made from harder stones. Carnelian is mined principally in India, Brazil, and Australia. Its physical properties are those of quartz.

Carniola Region, western Slovenia. It is located northeast of the head of the Adriatic Sea and includes a mountainous area. Its chief town is Ljubljana. It was part of the Roman province of Pannonia in ancient times and was occupied by the Slovenes in the 6th century ad. In the 13th century it became part of the Holy Roman Empire. In 1335 it became a possession of the Austrian Habsburgs, who held it as a duchy until 1849, when it was recognized as an Austrian crown land (1849-1918). After World War I it was divided between Italy and the new Kingdom of Serbs, Croats, and Slovenes (later Yugoslavia); it was incorporated entirely into Yugoslavia by a 1947 treaty. When Yugoslavia was fragmented in the 1990s, Carniola was included in Slovenia.

carnival Final celebration before the fasting and austerity of Lent in some Roman Catholic regions. The most famous and probably most exuberant carnival is that of Rio de Janeiro, which is celebrated with masked balls, costumes, and parades; the best-known U.S. celebration is Mardi Gras in New Orleans. The first day of carnival season varies with local traditions, but carnival usually ends on Shrove Tuesday, the day before the start of Lent.

carnivore Any meat-eating animal, but especially any member of the order Carnivora, consisting of 12 families of primarily predatory mammals: Canidae (e.g., dogs), Ursidae (bears), Procyonidae (raccoons), Mustelidae (weasels), Mephitidae (skunks), Viverridae (civets), Herpestidae (mongooses), Hyaenidae (hyenas), Felidae (cats), Otariidae and Phocidae (seals), and Odobenidae (the walrus). Though most carnivores eat only meat, some rely heavily on vegetation (e.g., the panda). Most have a complex tooth structure and a lower jaw that can move only vertically but can exert great power. The earliest carnivores, which probably evolved from

an insectivorous ancestor, appeared during the Paleocene Epoch (about 65-55 million years ago). Carnivores are highly intelligent.

carnivorous plant Any of about 400 diverse species of plants specially adapted for capturing insects and other tiny animals by ingenious pitfalls and traps and for digesting the nitrogen-rich animal proteins to obtain nutrients. These adaptations are thought to enable such plants to survive under otherwise marginal or hostile environmental conditions. The conspicuous trapping mechanism (a leaf modification) draws the prey's attention to the plant. More than half the species belong to the family Lentibulariaceae, most being bladderworts. The remainder belong to several families composed of the pitcher plants, sundews, and flytraps (see Venus's-flytrap). Most are found in damp heaths, bogs, swamps, and muddy or sandy shores where water is abundant and where nitrogenous materials are often scarce or unavailable because of acid or other unfavourable soil conditions. The smallest Drosera species are often hidden among the moss of a sphagnum bog; most carnivorous plants are small herbaceous perennials. Some become large shrubby vines.

carnosaur Any of the large carnivorous dinosaurs, a branch of theropod dinosaurs that evolved into predators of large herbivorous dinosaurs. Carnosaurs were massive animals with short necks, large skulls, and wide, gaping mouths equipped with formidable teeth. They walked on two legs. Tyrannosaurs were the largest of all carnosaurs. The carnosaurs became extinct at the end of the Cretaceous period (65 million years ago).

Carnot \kar-'no\, Lazare (-Nicolas-Marguerite) (b. May 13,

1753, Nolay, Burgundy, France — d. Aug. 2, 1823, Magdeburg, Prussian Saxony) French statesman and administrator in successive governments of the French Revolution. He entered the army as an engineer (1773) and was elected to the Legislative Assembly in 1791. As a leading member of the Committee of Public Safety and the Directory, he helped mobilize the Revolutionary armed forces and materiel, and he was lauded as the "Organizer of Victory." During the Coup of 1 8 Fructidor he fled France to escape arrest. He returned after Napoleon rose to power and served him in various offices, including minister of the interior during the Hundred Days.

Carnot \kar-'no\, (Nicolas-Leonard-) Sadi (b. June 1, 1796, Paris, France — d. Aug. 24, 1832, Paris) French scientist, known for describing the Carnot cycle. Son of Lazare Carnot, he was an army officer most of his life. Convinced that Britain's advanced steam engines and France's inadequate use of steam were factors in Napoleon's downfall, he wrote a nontechnical essay on steam engines (1824). He subsequently developed a theory of heat engines, predicting that efficiency depends only on the temperature of the hottest and coldest parts and not on the substance (steam or any other fluid) that drives the mechanism. Though adopted slowly, his theory was eventually incorporated into the general theory of THERMODYNAMICS.

Carnot, (Marie-Francois-) Sadi (b. Aug. 11, 1837, Limoges, France — d. June 24, 1894, Lyon) French politician. Grandson of Lazare Carnot and son of Sadi Carnot, he worked as a government engineer before turning to politics. After serving as minister of public works (1 880—81) and finance (1885-87), he was elected in 1887 as fourth president of the Third Republic. He competently handled the plots by Georges Boulanger, anarchist agitation, and the Panama Canal scandals, and retained his popularity through 10 different governments but was assassinated in 1894 by

an Italian anarchist.

Carnot cycle In heat engines, the ideal cycle of changes of pressures and temperatures of a working fluid, such as steam or ammonia, conceived by Sadi Carnot. It is the standard of performance of all heat engines operating between a high and a low temperature. In the cycle, the working

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fluid undergoes four successive changes: (1) the fluid receives heat, expanding at high temperature; (2) it delivers work during the reversible adiabatic expansion (it changes in volume or pressure without losing or gaining heat); (3) it rejects heat (to the heat sink) during compression at low temperature; and (4) it receives work during the reversible adiabatic compression. The efficiency is determined by the difference between the temperatures of the heat source and the heat sink divided by the temperature of the heat source. See also Rankine cycle.

Carnuntum Ancient town, Roman Empire. Located in northern Pannonia on the Danube River, it was an important Roman post from the time of Tiberius. It was used as a base by Marcus Aurelius in his campaign against the Marcomanni (ad 172-174); there he wrote the second book of his Meditations. The camp was finally destroyed by the Germans in the 4th century.

carob Leguminous evergreen tree (Ceratonia siliqua) native to the eastern Mediterranean region and cultivated elsewhere. It is sometimes known as locust, or St. John’s bread, in the belief that the “locusts” on which John the Baptist fed were carob pods. The tree, about 50 ft (15 m) tall, bears compound, glossy leaves with thick leaflets. Its red flowers are followed by flat, leathery pods that contain 5-15 hard brown seeds embedded in a sweet, edible pulp that tastes similar to chocolate.

carol Popular song, usually of religious joy, associated with a season, especially Christmas. It typically alternates verses with a repeated refrain or chorus. The carol originated in medieval England, with texts in English or Latin or both, and it was often associated with dancing and processions. The French noel, the German Weihnachtslied, and the Spanish villancico can also be regarded as carols.

Carol I Vka-rol ,\ English Vkar-sl \orig. Karl Eitel Friedrich, prince von Hohenzollern-Sigmaringen (b. April 20, 1839, Sigmaringen, Hohenzollem-Sigmaringen — d. Oct. 10 1914, Sinaia, Rom.) King of Romania (1881-1914). Originally a German prince, he became prince of Romania in 1 866, and when Romania gained full independence from the Ottoman Empire he was crowned its first king. He brought notable military and economic development along Western lines, but his neglect of festering rural problems led to the bloody peasant rebellion of 1907.

Carol II (b. Oct. 15, 1893, Sinaia, Rom. — d. April 4, 1953, Estoril, Port.) King of Romania (1930^-0). He became crown prince on the death of his great uncle, Carol I, in 1914. Because of his scandalous affair with Magda Lupescu (18967-1977), he was obliged to renounce his rights to the throne and go into exile in 1925, but he returned in 1930 and became king. He gradually undermined Romanian democracy and in 1938 proclaimed a corporatist dictatorship, but in 1940 he was forced to abdicate in favour of his son Michael.

Caroline Islands Archipelago, western Pacific Ocean. Lying south of the Philippines, the islands cover a land area of about 460 sq mi (1,190 sq km). Formerly part of the U.S. -administered Trust Territory of the Pacific Islands, the group consists of several larger islands, including Yap, Pohnpei, Chuuk (Truk), Kosrae, and Babelthuap, as well as many small coral islets and reefs. Though explored by the Spanish in the 16th century, they were rarely visited until Germany took them in 1899. Granted as a mandate to Japan after World War I, they were placed under U.S. trusteeship in 1947. The islands became the Federated States of Micronesia in 1986, with the exception of Palau (Babelthuap and associated islands), which became independent in 1994.

Carolingian V.kar-o-'lin-jonV art
Art produced in Europe during the reign of Charlemagne and his successors until c. 900. The outstanding characteristic of the period was a revival of interest in Roman antiquity. Works of Byzantine art and architecture served as models. Illuminated manuscripts and relief scenes in ivory and metalwork reflected Classical motifs; mosaics and murals were also produced, but few have survived.

Ivory book cover from the Lorsch Gospels, early 9th century; in the Victoria and Albert Museum, London.

COURTESY OF THE VICTORIA AND ALBERT MUSEUM, LONDON, CROWN COPYRIGHT

Carolingian dynasty Family of Frankish aristocrats that ruled nearly all or part of western Europe in 751-987. Pippin I (d. 640), the dynasty’s founder, came to power in the office of mayor of the palace under the

Merovingian king Chlotar II, with authority over Austrasia. From this post, his descendants, including Charles Martel, continued to usurp authority from the Merovingians, who remained on the throne as figureheads until 751, when Charles's son Pippin III, with papal support, deposed Childeric III and formally took the title of King of the Franks. Under Pippin's son Charlemagne (Carolus Magnus — the source of the dynasty's name), the Carolingian realm was extended into Germany and Italy, where he conquered the Lombards and continued the alliance with Rome. Charlemagne also promoted religious reform and cultural growth and was crowned emperor by Pope Leo III on Dec. 25, 800. On his death, Charlemagne was succeeded by his son Louis the Pious, whose three sons divided the realm in 843. Despite internal strife and foreign invasion, the dynasty survived until 911 in the eastern part of the realm, where German rulers would revive Carolingian political ideals later in the century, and in the western realm until 987.

Carondelet Vko-.ran-ds-'leA, (Francisco Luis) Hector, baron de

(b. c. 1748, Noyelles, Flanders— -d. Aug. 10, 1807, Quito, Viceroyalty of New Granada) Spanish governor of the territory of Louisiana and western Florida (1791-97). When he arrived in New Orleans, he formed alliances with local Indian tribes to defend disputed territory north of the 31st parallel of latitude against U.S. settlers. He negotiated with Gen. James Wilkinson to effect the secession of the trans-Appalachian territories from the U.S. and to secure their alliance with Spain. These efforts were terminated in 1795 with the signing of Pinckney's Treaty (see Thomas Pinckney). Carondelet was recalled in 1797 and went to South America to become governor-general of Quito.

carotene Vkar-3-,ten\ Any of several organic compounds widely distributed in plants and animals. They are pigments that give orange, yellow, or sometimes red colours to, for example, dandelions, apricots, carrots, sweet potatoes, butter, egg yolks, canary feathers, and lobster shells. Carotenes are converted in the body into vitamin A, but, unlike the vitamin, they are not toxic even at high doses. Carotene has an antioxidant effect and is therefore used in pharmaceuticals and as a food and feed additive, as well as to colour margarine and butter.

Carothers \ko-'r9th-3rz\, W(allace) H(ume) (b. April 27, 1896, Burlington, Iowa, U.S. — d. April 29, 1937, Philadelphia, Pa.) U.S. chemist. He became director of organic chemical research at DuPont in 1928. There he first worked on polymerization of acetylene and derivatives, leading to the development of neoprene. His outstanding achievement involved the theory of linear polymerization; he tested it by synthesizing polymers structurally resembling cellulose and silk, culminating in the production of nylon. The first synthetic polymer fibre to be produced commercially (1938), it laid the foundation of the synthetic fibre industry.

carp Hardy, greenish brown fish (Cyprinus carpio, family Cyprinidae) native to Asia but introduced into Europe, North America, and elsewhere. Large-scaled, with two barbels (fleshy, whiskerlike feelers) on each side of its upper jaw, the carp lives alone or in small schools in quiet, weedy, mud-bottomed ponds, lakes, and rivers. An omnivore, it often stirs up sediment while rooting about for food, adversely affecting many plants and animals. Carp grow to an average length of about 14 in. (35 cm); some grow to 40 in. (100 cm) and 49 lbs (22 kg). In captivity they may live more than 40 years.

Carpaccio Vkar-'pat-choV Vittore (b. c. 1460, Venice — d. 1525/26, Venice) Italian painter active in Venice. Little is known of his early life, but the dominant influences on his work were the Bellini family and Antonello da Messina. In the 1490s he began the first of four cycles of paintings that are his greatest achievement: scenes from the life of St. Ursula, now in the Accademia, Venice; scenes from the lives of St. George, St. Jerome, and St. Tryphon (1502-07) for the Scuola di San Giorgio degli Schiavoni, Venice; and scenes from the life of the Virgin (c. 1500-10) and the life of St. Stephen (1511-20). He was one of the greatest early Renaissance narrative painters of the Venetian school.

carpal tunnel syndrome (CTS) Vkar-poL Painful condition caused by repetitive stress to the wrist over time. The median nerve and the tendons that bend the fingers pass through the carpal tunnel on the inner side

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of the wrist, between the wrist (carpal) bones on three sides and a ligament on the fourth. Repetitive finger and wrist movements rub the tendons against the walls of the carpal tunnel and may make the tendons swell, squeezing the nerve. Numbness, tingling, and pain in the wrist and hand may progress to loss of muscle control. CTS is most common in assembly-line workers and computer keyboard users. Treatment may include avoidance of the causative activity, ergonomic workplace design, anti-inflammatory drugs, brace or splint use, and surgery.

Carpathian Mountains \kar-'pa-the-3n\ Mountain system, eastern Europe. It extends along the Slovakia-Poland border and southward through Ukraine and eastern Romania about 900 mi (1,450 km). Its highest peak, Gerlachovka (in Slovakia), rises 8,711 ft (2,655 m). The Little Carpathians and White Carpathians are its southwestern extensions; the Transylvanian Alps are sometimes called the South Carpathians. The mountains are the source for the Vistula, Dniester, and Tisza rivers. Agriculture, forestry, and tourism are economically important.

carpel One of the leaflike, seed-bearing structures that constitute the innermost whorl of a flower. One or more carpels make up the pistil. Fertilization of an egg within a carpel by a pollen grain from another flower results in seed development within the carpel.

Carpentaria \ 1 kar-pen- , tar-e-o\ / Gulf of Gulf, northeastern Australia. An inlet of the Arafura Sea, it is bordered by the Northern Territory and by Cape York Peninsula and extends north-south about 375 mi (600 km) and east-west 310 mi (500 km). It was explored by the Dutch 1605-28; its western coasts were discovered by Abel Janszoon Tasman in 1644. Neglected for centuries, it became economically significant from the late 20th century for its bauxite and manganese deposits and for its prawn-rich waters.

Carpenter Gothic U.S. domestic architecture style of the 19th century. The houses executed in this phase of the Gothic Revival style display

little awareness of the original Gothic approach, but rather an eclectic and naive use of superficial Gothic decorative motifs. Turrets, spires, and pointed arches were liberally applied, as was much decorative gingerbread, made possible by the invention of the scroll saw. Carpenter Gothic houses were built throughout the U.S., but surviving structures are found chiefly in the Northeast and Midwest.

Carpentier, Ale jo (b. Dec. 26, 1904, Lausanne, Switz. — d. April 24, 1980, Paris, France) Latin American novelist, essayist, and playwright, a leading literary figure. Born to a French father and a Russian mother, Carpentier spoke French before he learned Spanish, although he was taken to Havana, Cuba, as an infant. Educated in Havana, he helped found the Afro-Cuban movement that sought to incorporate African forms into the arts. He initiated the use of magic realism in his story collection Guerra del tiempo (1958; War of Time). His best-known novel, Los pasos perdidos (1953; The Lost Steps), portrays a character who travels to the Orinoco jungle in search of the origins of time. Carpentier fled Cuba in 1928 and settled in Paris. In 1945 he went to Venezuela, but in 1959 he returned to Cuba and became a diplomat in Fidel Castro’s regime.

carpet See rug and carpet

carpetbagger Epithet used during the Reconstruction period (1865—77) to describe a Northerner in the South seeking private gain. The word referred to an unwelcome outsider arriving with nothing more than his belongings packed in a satchel or carpetbag. Many carpetbaggers were involved in corrupt financial schemes, but others helped rebuild the economy in the South and participated in educational and social reform.

Carpoc ration \,kar-p9-'kra-sh9n\ Follower of the 2nd-century Christian Gnostic Carpocrates, whose sect flourished in Alexandria. Carpocratians revered Jesus as an ordinary man whose soul had not forgotten that its origin and true home was within the sphere of the unknown perfect God. They rejected the created world, claimed superiority due to their ability to communicate with demons, and subverted biblical law as the work of the evil angels who created the world. Their goal of transcendent freedom required having every possible experience, which required several lifetimes. The first sect known to have used pictures of Christ, they also made images of Plato, Pythagoras, and Aristotle. See also Gnosticism.

Carracci \ka-'rat-che\ family Family of Italian painters. Annibale Carracci (1560-1609) was prominent in Bologna and Rome in the movement against Mannerism. In the 1580s, with his brother and cousin, he founded a teaching academy in Bologna, the Accademia degli Incamminati

(“Academy of the Progressives”). He specialized in fresco painting and monumental religious altarpieces but was also a pioneer in the development of ideal landscapes, genre subjects, and caricature. The fresco decoration of the Gallery of the Famese Palace in Rome (1597-1601), comprising scenes from the loves of the gods, remains his masterpiece; it was indispensable as a source of figure design and technical procedure for young painters into the 1 8th century. His elder brother, Agostino Carracci (1557-1602), assisted him in decorating the Farnese Gallery but was known primarily as a teacher and engraver; his anatomical studies were used as teaching aids for nearly two centuries. His cousin Lodovico (or Ludovico) Carracci (1555-1619) collaborated with them on various fresco commissions. He directed the academy in Bologna after his cousins had

gone to Rome, produced works of a passionate and poetic quality, and trained some of the major Bolognese artists of the next generation, including Domenichino, Guido Reni, and Alessandro Algardi. See also Bolognese school.

Carranza \kar-'ran-sa\, Venustiano (b. Dec. 29, 1859, Cuatro Cienegas, Mex. — d. May 20/21, 1920, Tlaxcalantongo) First president of the post-PoRFiRio Diaz Mexican Republic (1917-20). The son of a landowner, he was active in politics from 1877. In 1910 he joined the struggle of Francisco Madero against Diaz. A moderate and a nationalist, he favoured political but not social reform. Because he did little to implement the far-reaching reforms called for in the constitution of 1917, his presidency was plagued by social unrest and clashes with the more radical leaders Pancho Villa and Emiliano Zapata as well as by serious financial problems. His nationalism led him to oppose U.S. intervention in Mexican affairs, even when he stood to benefit from it. He is held responsible for Zapata's assassination and was himself murdered while fleeing an armed rebellion. See also Mexican Revolution.

Venustiano Carranza, c. 1910

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Carre, John Le See John Le Carre

Carrel \k3-'rel\, Alexis (b. June 28, 1873, Sainte-Foy-les-Lyon, Fra. — d. Nov. 5, 1944, Paris) French surgeon, sociologist, and biologist. He received a 1912 Nobel Prize for developing a way to suture (stitch) blood vessels and laid the groundwork for further studies of blood-vessel and organ transplantation. He also researched preservation of tissues outside the body and the application of the process to surgery, and he helped develop the Carrel-Dakin method of flushing wounds with an antiseptic. His writings include Man, the Unknown (1935), The Culture of Organs (with Charles A. Lindbergh, 1938), and Reflections on Life (1952).

Carrhae \'kar-e\. Battle of (53 bc) Battle that stopped the Roman invasion of Parthian Mesopotamia (see Parthia). The Romans were led by Crassus, who wanted a victory to balance those of his fellow triumvirs

Pompey and Julius Caesar. With seven legions (about 44,000 men) but little cavalry, he was defeated in the desert by 10,000 mounted Parthian archers and was killed while trying to negotiate. His defeat damaged Roman prestige, and his death gave impetus to Caesar’s quest for power.

carriage Four-wheeled, horse-drawn vehicle, mainly for private passenger use. It was the final refinement of the horse-drawn passenger conveyance, having developed from the wagon, chariot, and coach. Light carriages with enhanced suspension for added comfort had been developed by the 17th century. A variety of carriages were common in the 19th century, including the brougham and the buggy. Carriage manufacturers provided the very similar early designs for automobile bodies.

Carrickfergus X.kar-ik-'for-gosN District (pop., 2001: 37,659), northeastern Northern Ireland. Established in 1974, it lies on Belfast Lough. The name, meaning “rock of Fergus,” commemorates King Fergus, shipwrecked off the coast c. ad 320. Carrickfergus town (pop., 1991: 22,786) is the district seat. Carrickfergus Castle, a relic of the Norman period, sits on a crag above the town; it was a refuge for the Protestants of Antrim in the English Civil Wars.

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Carrier, Willis Haviland (b. Nov. 26, 1876, Angola, N.Y., U.S. — d. Oct. 7, 1950, New York, N.Y.) U.S. inventor and industrialist. Carrier designed the first system to control temperature and humidity in 1902. His “Rational Psychrometric Formulae,” introduced in 1911, initiated scientific air-conditioning design. In 1915 he cofounded the Carrier Engineering Company, which became the world’s largest manufacturer of air-conditioning equipment. Carrier was purchased by United Technologies Corporation in 1979.

Camera \,ka-re-'a-r3\, Rosalba (Giovanna) (b. Oct. 7, 1675, Venice — d. April 15, 1757, Venice) Venetian pastel portraitist and miniaturist. She became known for her miniature portraits on snuffboxes and was the first artist to use ivory rather than vellum as a support for miniatures. An originator of the Rococo style, she achieved spectacular success throughout Europe with her fashionable pastel portraits of notables. On a trip to Paris (1720-21) she received commissions for numerous portraits, including one of Louis XV as a child. In 1721 she was elected to the French Royal Academy.

Carroll, Charles (b. Sept. 19, 1737, Annapolis, Md. — d. Nov. 14, 1832, Baltimore, Md., U.S.) American patriot leader. He attended Jesuit colleges in Maryland and studied law in France and England. He served on Committees of Correspondence, signed the Declaration of Independence, and served in the Continental Congress (1776-78). He was a U.S. senator (1789-92).

Carroll, Lewis orig. Charles Lufwidge Dodgson (b. Jan. 27,

1832, Daresbury, Cheshire, Eng. — d. Jan. 14, 1898, Guildford, Surrey) British logician, mathematician, and novelist. An unmarried deacon and a lecturer in mathematics at the University of Oxford, he enjoyed the company of young girls. His novel Alice’s Adventures in Wonderland (1865; illustrated by John Tenniel) is based on stories he told to amuse young friends, especially Alice Liddell. Its sequel, Through the Looking-Glass (1871), describes Alice’s further adventures. The two books, full of whimsy but also of sophisticated wit and puzzles, became among the most famous and admired children’s books in the world. Carroll’s other works include the narrative nonsense poem The Hunting of the Snark(\%16) and the children’s novels Sylvie and Bruno (1889) and Sylvie and Bruno Concluded (1893). He was also an important early portrait photographer.

carrot Herbaceous, generally biennial plant (Daucus carota) of the parsley family, that produces an edible globular or long taproot in the first growing season. Native to Afghanistan and neighbouring lands, it is grown extensively in temperate zones. It is a rich source of carotene.

An erect rosette of feathery leaves develops above ground in the first season; the edible carrot is below.

After a rest period at temperatures near freezing, large flower stalks arise, bearing large compound umbels.

Carson (of Duncairn),

Edward Henry, Baron (b. Feb.

9, 1854, Dublin, Ire.— d. Oct. 22,

1935, Minster, Kent, Eng.) Irish lawyer and politician. In 1892 he was elected to the British House of Commons and was appointed Irish solicitor general. He served as British solicitor general (1900-05), attorney general (1915), first lord of the Admiralty (1916-17), and lord of appeal (1921-29). Known as the “uncrowned king of Ulster,” he successfully led Northern Irish resistance to the British government’s attempts to introduce Home Rule for all of Ireland.

Carrot (Daucus carota).

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Carson, Johnny in full John William Carson (b. Oct. 23, 1925, Corning, Iowa, U.S. — d. Jan. 23, 2005, Los Angeles, Calif.) U.S. television personality. He worked as a radio announcer and television comedy writer before hosting several television quiz shows (1955-62). As the

long-standing host of The Tonight Show (1962-92), he was noted for his wry monologues, comedy sketches, and genial banter, and the program became a staple for a large and faithful late-night audience.

Carson, Kit orig. Christopher Carson (b. Dec. 24, 1809, Madison county, Ky., U.S. — d. May 23, 1868, Fort Lyon, Colo.) U.S. frontiersman,

scout, and Indian agent. Raised in Missouri, he ran away from home at age 15 to become a trapper and trader in the Southwest. In the early 1840s he served as a guide to John

C. Fremont’s explorations of the West. He guided Gen. Stephen Kearny’s expedition to California during the Mexican War, often carrying dispatches to Washington,

D. C. In 1854 he was appointed Indian agent (an official representative of the U.S. government to Indian tribes) at Taos, N.M. During the American Civil War he commanded the 1st New Mexico Volunteers. In 1868 he was appointed superintendent of Indian affairs for the Colorado Territory. His contributions to westward expansion made him a folk hero.

Carson, Rachel (Louise) (b. May 27, 1907, Springdale, Pa., U.S. — d. April 14, 1964, Silver Spring, Md.) U.S. biologist and science writer. Carson trained as a marine biologist and had a long career at the U.S. Fish and Wildlife Service. The Sea Around Us (1951) won a National Book Award. Her prophetic Silent Spring (1962), about the dangers of pesticides in the food chain, is regarded as the seminal work in the history of the environmental movement, which in some respects can be seen to date from its publication.

Carson City City (pop., 2000: 52,457), capital of Nevada, U.S. Located east of Lake Tahoe and south of Reno, it was settled in 1858 and named for Kit Carson. The discovery of silver in 1 859 in the nearby Virginia City area stimulated Carson City’s economy.

The federal government established a mint at Carson City, which later became the Nevada State Museum.

Carson City became the state capital in 1864 when Nevada gained statehood.

cart Two- wheeled vehicle drawn by a draft animal, used throughout recorded history for transporting

freight and people. The simplest of vehicles, its frame consists merely of crossed wooden stakes or a box with shafts as an extension of the frame.

Carts are known to have been used by the Greeks and Assyrians by 1 800 bc, though earlier use (c. 3500 bc) can be assumed.

Cartagena \,kar-ta-'ha-na\ City (pop., 2003 est.: 902,688), Colombia. Located on the northern coast, it has a good harbour and is Colombia's principal port for oil exports. Founded in 1533, it became one of Spanish America's chief cities. It was strongly fortified and often attacked, notably by British forces under Francis Drake (c. 1585-86) and Edward Vernon (c. 1741-42). It remained under Spanish control until the province of Cartagena, which included the city, declared independence in 1811. After reverting back to Spanish control in 1815, the city was recaptured by patriot forces in 1821. It declined in the 19th century but regained prominence in the 20th century as an oil-processing centre.

Cartagena Port city (pop., 2001: 184,686), southeastern Spain. Founded by the Carthaginians under Hasdrubal in 227 bc, it was captured by Scipio Africanus the Elder in 209 bc and made a Roman colony. It was sacked by the Goths in ad 425. It was held by the Moors from 711 until it was taken by James I of Aragon in 1269. In the 16th century Philip II made it a great naval port; it remains Spain's chief Mediterranean naval base as well as a commercial port.

cartel \,kar-'tel\ Organization of a few independent producers for the purpose of improving the profitability of the firms involved (see oligopoly). This usually involves some restriction of output, control of price, and allocation of market shares. Members of a cartel generally maintain

State Capitol, Carson City, Nev.

DONALD DONDERO

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their separate identities and financial independence while engaging in cooperative policies. Cartels can either be domestic (e.g., the historical example of the German IG Farben) or international (e.g., OPEC). Because cartels restrict competition and result in higher prices for consumers, they are outlawed in some countries. The only industry operating in the U.S. with a blanket exemption from the antitrust laws is major league baseball, but several U.S. firms have been given permission to participate in international cartels.

Cartel des Gauches \kar-'tel-da-'gosh\ (French: “Coalition of the Left”) In the French Third Republic, a coalition of left-wing parties (the Socialists and the Radicals) in the Chamber of Deputies. They formed the Cartel in opposition to the right-wing Bloc National, which they defeated in the elections of 1924. Led by Edouard Herriot and later Aristide Briand, the Cartel was defeated in 1926 by a financial crisis brought about by continuing inflation.

Carter, Benny orig. Bennett Lester Carter (b. Aug. 8, 1907, New York, N.Y., U.S. — d. July 12, 2003, Los Angeles, Calif.) U.S. jazz musician. Known as one of the primary stylists of the alto saxophone, he was also an accomplished arranger, composer, clarinetist, trumpeter, and bandleader. He played in the big bands of Chick Webb and Fletcher Henderson before assuming leadership of McKinney’s Cotton Pickers (193 1—32). Carter worked in Europe (1935-38) and moved to California in 1945 to write music for film and television. His best-known composition is “When Lights Are Low.” He was awarded the National Medal of Arts in 2000.

Carter, Elliott (Cook, Jr.) (b. Dec. 11, 1908, New York, N.Y., U.S.) U.S. composer. Born to a wealthy family, he studied English and music at Harvard University and later studied in Paris with Nadia Boulanger. He taught at many institutions, after 1972 primarily at the Juilliard School. He absorbed a range of influences, including Igor Stravinsky and Charles Ives. His style evolved into a densely contrapuntal, dissonant, and rhythmically complex texture in which the various instrumental parts frequently suggest conversation and combat. His principal works include a sonata for flute, oboe, cello, and harpsichord (1952), Variations for Orchestra (1955), a double concerto for piano and harpsichord (1961), a piano concerto (1965), Concerto for Orchestra (1969), A Symphony of Three Orchestras (1977), Night Fantasies for piano (1980), and four string quartets (1951, 1959, 1971, 1986), two of which received the Pulitzer Prize. He is often called the greatest American composer of the late 20th century.

Carter, Jimmy orig. James Earl Carter (b. Oct. 1, 1924, Plains, Ga., U.S.) 39th president of the U.S.

(1977-81). He graduated from Annapolis and served in the U.S.

Navy until 1953, when he left to manage the family peanut business.

He served in the state senate from 1962 to 1966. He ran unsuccessfully for governor in 1966; depressed by this experience, he found solace in evangelical Christianity, becoming a born-again Baptist. In 1970 he ran again and won. As governor (197 1—

75), he opened Georgia’s government offices to African Americans and women and introduced stricter budgeting procedures for state agencies. In 1976, though lacking a national political base or major backing, he won the Democratic nomination and the presidency, defeating the Republican incumbent, Gerald Ford. As president, Carter helped negotiate a peace treaty between Egypt

and Israel, signed a treaty with Panama to make the Panama Canal a neutral zone after 1999, and established full diplomatic relations with China. In 1979-80 the Iran hostage crisis became a major political liability. He responded forcefully to the Soviet Union's invasion of Afghanistan in 1979, embargoing the shipment of U.S. grain to the Soviet Union and pressing for a U.S. boycott of the 1980 Summer Olympics in Moscow. The poor state of the economy, which was plagued by high inflation and high unemployment, contributed to Carter's electoral defeat by Ronald Reagan in 1980. He subsequently became involved in numerous international diplomatic negotiations and helped to oversee elections in countries with insecure democratic traditions; he also became the first sitting or former American president to visit Fidel Castro's Cuba. He was awarded the Nobel Prize for Peace in 2002.

Carter Family U.S. singing group. It consisted of Alvin Pleasant Carter (1891-1960), his wife Sara (1898-1979), and his sister-in-law Maybelle (1909-78). Natives of Virginia, they began their recording career in 1927. Over 16 years, with various combinations of Carter daughters, they recorded more than 300 songs from the 19th and early 20th centuries, including "Wabash Cannonball," "I'm Thinking Tonight of My Blue Eyes," "Wildwood Flower," and "Keep on the Sunny Side." They helped popularize Appalachian folk songs. After the original group broke up in 1943, its members continued to perform. "Mother" Maybelle Carter formed a successful act with her daughters and later performed with her son-in-law Johnny Cash. In the 1950s the Carter Family re-formed and appeared intermittently, with a changing lineup. The original Carter Family was the first group admitted (1970) to the Country Music Hall of Fame.

Carteret \'kart-3-,ret\, Sir George (b. c. 1610, probably Jersey, Channel Islands, Eng. — d. January 1680, New Jersey) British politician and colonial proprietor. His naval exploits and service as lieutenant governor of the Channel Island of Jersey won him a knighthood (1644) and baronetcy (1645). After the 1660 Restoration he became a powerful administrator and legislator. In 1663 he became one of eight original proprietors granted the area of Carolina; in 1664 he received half of New Jersey, named for his birthplace. The other owner sold out to the Quakers in 1674. With the Quakers, Carteret agreed to divide the colony. After Carteret's death, his heirs sold the remaining portion to the Quakers.

Cartesian \,kar-'te-zh3n\ circle Allegedly circular reasoning used by Rene Descartes to show that whatever he perceives "clearly and distinctly" is true. Descartes argues that clear and distinct perception is a guarantor of truth because God, who is not a deceiver, would not allow Descartes to be mistaken about that which he clearly and distinctly perceives. The argument relies on Descartes's earlier proof of the existence of God. But Descartes cannot know that this proof does not contain an error unless he assumes that his clear and distinct perception of the steps of his reasoning guarantees that the proof is correct. Thus the criterion of clear and distinct perception depends on the assumption that God exists, which in turn depends on the criterion of clear and distinct perception. See also COGITO, ERGO SUM.

Cartesianism Philosophical tradition derived from the philosophy of Rene Descartes. A form of rationalism, Cartesianism upholds a metaphysical dualism of two finite substances, mind and matter. The essence of mind is thinking; the essence of matter is extension in three dimensions. God is a third, infinite substance, whose essence is necessary existence. God

unites minds with bodies to create a fourth, compound substance, man. Mind-body dualism generates problems concerning the possibility of causal interaction between mind and body and knowledge of the external world (see mind-body problem), and various lines of Cartesianism developed from different proposed solutions to these problems. A historically important Cartesian theory holds that animals are essentially machines, lacking even the ability to feel pain. See also Arnold Geulincx; Nicolas de Malebranche; occasionalism.

Carthage Ancient city and state, northern Africa. Located near modern Tunis, Tun., it was built around a citadel called the Byrsa. Founded by colonists from Tyre, probably in the 8th century bc, its people undertook conquests in western Africa, Sicily, and Sardinia in the 6th century bc. Under the descendants of Hamilcar, it came to dominate the western Mediterranean Sea. In the 3rd century bc it fought the first of the three Punic Wars with Rome. Destroyed by a Roman army led by Scipio Africanus the Younger (146 bc), it became the site of a colony founded by Julius Caesar in 44 bc; in 29 bc Augustus made it the administrative centre of the province of Africa. Among the Christian bishops who served there were Tertuluan and St. Cyprian. Captured by the Vandals in 439 and the Byzantine Empire in the 6th century, it was taken by the Arabs in the 7th century and was eclipsed by their emphasis on Tunis.

Carthaginian Wars See Punic Wars

Carthusian \kar-'thii-zh3n\ Member of a Roman Catholic monastic order founded by St. Bruno of Cologne (c. 1030-1101) in 1084 in the Chartreuse valley of southeastern France. Members of the Order of Carthusians pray, study, eat, and sleep alone but gather in church for morning mass, vespers, and the night office. They dine together on Sundays and major holidays and walk together once a week. They wear hair shirts, abstain from eating meat, and consume only bread and water on Fridays and fast days. At the motherhouse, or Grande Chartreuse (today

Jimmy Carter.

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in Voiron, Isere), the monks distill the liqueur that bears the house’s name. Carthusian nuns are also strictly cloistered and contemplative.

Cartier \kar-'tya\, Jacques (b. 1491, Saint-Malo, Brittany, France — d. Sept. 1, 1557, near Saint-Malo) French sailor and explorer. He was commissioned by Francis I to explore North America in the hope of discovering gold, spices, and a passage to Asia. Cartier’s explorations of the

North American coast and the St. Lawrence River (1534, 1535, 1541 – 42) did not produce the desired results, but they did lay the basis for later French claims to Canada.

Cartier \kar-'tya\, Sir George Etienne, Baronet (b. Sept. 6, 1814, St. Antoine, Lower Canada – d. May 20, 1873, London, Eng.) Canadian prime minister jointly with John Macdonald (1858-62). He was elected as a Liberal to the Canadian legislative assembly (1848) and was later appointed provincial secretary (1855) and attorney general for Canada East (1857). In 1858 Cartier represented Canada East in the alliance with Macdonald and promoted the improvement of Anglo-French relations in Canada. He was a proponent of the Grand Trunk Railway. In 1867, despite great opposition, he carried his native province into confederation. He then served as minister of militia and defense in Macdonald's first Confederation cabinet (1867-72).

Cartier-Bresson \kar-tya-br3-'so n \, Henri (b. Aug. 22, 1908, Chanteloup, Fr. – d. Aug. 3, 2004, Cereste) French photographer. He studied art in Paris and literature and painting at the University of Cambridge. His interest in photography developed c. 1930 when he encountered the works of Eugene Atget and Man Ray. He is known for spontaneous, sequential images in still photography, a technique inspired by his enthusiasm for filmmaking. He helped establish photojournalism as an art form and with Robert Capa, David Seymour, and others founded the cooperative Magnum Photos (1947). The best known of his many collections is The Decisive Moment (1952).

cartilage \'kar-t 3 l-ij\ Connective tissue in parts of the human skeleton. A network of collagen fibres in a firm, gelatinous base, it contains no blood vessels or nerves. Different types of cartilage are found at the ends of some bones and in nasal and respiratory structures; in the spinal disks; and in the ear and epiglottis (back of the throat). Most of the skeleton of an embryo is made of cartilage, which is later replaced by bone.

Cortland, Dame (Mary) Barbara (Hamilton) (b. July 9, 1901, Edgbaston, Birmingham, Eng. – d. May 21, 2000, Hatfield, Hertfordshire) English author. Her first novel, Jigsaw (1925), was a popular success. She wrote two more novels and a play during the 1920s; thereafter her output grew steadily, and by the 1970s she was averaging 23 books a year, all of which she dictated. Her approximately 600 books, mostly formulaic romance novels, have sold more than 600 million copies. Cartland's nonfiction includes autobiographies and books on health food, vitamins, and beauty. She was the step-grandmother of Diana, Princess of Wales.

cartography \kar-'ta-gro-fe\ or mapmaking Art and science of representing a geographic area graphically, usually by means of a map or chart. Political, cultural, or other nongeographic features may be superimposed. Ptolemy's eight- volume Geography showed a flat, disc-shaped projection of part of the Earth. Medieval European maps followed Ptolemy's guide but placed east at the top of the map. In the 14th century more-accurate maps were developed for use in navigation. The first surviving globe dates from 1492. Discovery of the New World led to new techniques in cartography, notably projection of a curved surface onto a flat surface. In particular, Gerardus Mercator projected landmasses onto a cylinder wrapped around the Earth's Equator. Such cylindrical projections maintain proper directions or bearings, though they cause distortions in distances at high latitudes. Contour maps show relief by connecting points of equal elevation with lines, mean sea level being the reference point. Mod-

ern cartography uses aerial photography and satellite radar for a degree of accuracy previously unattainable. Satellites have also made possible the mapping of features of the Moon and of several planets and their moons. See also geographic information system; global positioning system.

cartoon Originally, a full-size drawing used for transferring a design to a painting, tapestry, or other large work. Cartoons were used from the 15th century by fresco painters and stained-glass artists. In the 19th century the term acquired its popular meaning of a humorous drawing or parody. Cartoons in that sense are used today to convey political commentary, editorial opinion, and social comedy in newspapers and magazines. The greatest early figure is William Hogarth, in 18th-century Britain.

In 19th-century France, Honore Daumier introduced accompanying text that conveyed his characters' unspoken thoughts. Britain's Punch became the foremost 19th-century venue for cartoons; in the 20th century The New Yorker set the American standard. A Pulitzer Prize for editorial cartooning was established in 1922. See also caricature; comic strip.

Cartwright, Alexander (Joy) (b. April 17, 1820, New York, N.Y., U.S. — d. July 12, 1892, Honolulu, Hawaii) U.S. surveyor and baseball enthusiast. Cartwright was a founder of the amateur New York Knickerbocker Base Ball Club and chaired the commission that established baseball's official rules. These included the requirement of tagging out a base runner rather than hitting him with a thrown ball and fixing the distance between bases at 90 ft (27.4 m). The first game under the newly codified rules was apparently played in Hoboken, N.J., in 1846. See also Abner Doubleday.

Cartwright, Edmund (b. April 24, 1743, Marnham, Nottinghamshire, Eng. — d. Oct. 30, 1823, Hastings, Sussex) British inventor. On visiting Richard Arkwright' s cotton-spinning mills, he was inspired to construct a power-driven machine for weaving. He invented a power loom and set up a weaving and spinning factory in Yorkshire. In 1789 he patented a wool-combing machine. In 1809 the House of Commons voted to reward him for the benefits his loom had conferred on the nation. His other inventions included a cordelier (machine for making rope) and a steam engine that used alcohol instead of water.

Caruso \k3-'ru-so\, Enrico orig. Errico Caruso (b. Feb. 27, 1873, Naples, Italy — d. Aug. 2, 1921, Naples) Italian tenor. Apprenticed to a mechanical engineer at age 10, at 18 he began to sing in public in his free time. He attracted the notice of a teacher and made his professional debut in 1894. He sang his best-known role, Canio in Ruggero Leoncavallo's Pagliacci, for the first time in 1896. He recovered from a disastrous La Scala debut in 1900 and within two years had gained the high notes that made him an international star and a legend. He sang at the Metropolitan Opera (1903-20) in almost 60 roles, becoming the most famous male opera star of his time. His warm, appealing tenor voice of great emotive power made his recordings (which include some of the first vocal recordings ever made) best-sellers for decades after his death.

Carver, George Washington (b

U.S. — d. Jan. 5, 1943, Tuskegee,

Ala.) U.S. agricultural chemist and

agronomist. Born a slave, Carver lived until age 10 or 12 on his former owner's plantation, then left and worked at a variety of menial jobs.

He did not obtain a high school education until his late twenties; he then obtained bachelor's and master's degrees from Iowa State Agricultural College. In 1896 he joined Booker T.

Washington at the Tuskegee Institute (now Tuskegee University) in Alabama, where he became director of agricultural research. He was soon promoting the planting of peanuts and soybeans, legumes that he knew would help restore the fertility of soil depleted by cotton cropping. To make them profitable, he worked intensively with the sweet potato and the peanut (then not even recognized as a crop), ultimately developing 118 derivative products from sweet potatoes and 300 from peanuts. His efforts helped liberate the South from its untenable cotton dependency; by 1940 the peanut was the South's second largest cash crop. During World War II he devised 500 dyes to replace those no longer available from Europe. Despite international acclaim and extraordinary job offers, he remained at Tuskegee throughout his life, donating his life's savings in 1940 to establish the Carver Research Foundation at Tuskegee.

Carver, Jonathan (b. April 13, 1710, Weymouth, Mass. — d. Jan. 31, 1780, London, Eng.) American explorer. He served in the French and Indian War. In 1766 he was sent by Maj. Robert Rogers to explore an area west of northern Michigan. He traveled through the Great Lakes and up

. 1861?, near Diamond Grove, Mo.,

George Washington Carver

COURTESY OF THE TUSKEGEE INSTITUTE, AlABAMA;
PHOTOGRAPH, P.H. POLK

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Cary ► cashew i 345

the Mississippi River, wintering in a Sioux village. Though his travel journal (published 1778) was a huge success, he died penniless.

Cary, (Arthur) Joyce (Lunel) (b. Dec. 7, 1888, Londonderry, Ire. — d. March 29, 1957, Oxford, Oxfordshire, Eng.) British novelist. Cary studied art in Edinburgh and Paris before graduating from the University of Oxford. After serving in West Africa in World War I, he began publishing short stories, then novels, some set in Africa, including An American Visitor (1933) and Mister Johnson (1939). The Horse's Mouth (1944), his best-known novel, was the third in a trilogy in which each volume is narrated by one of three protagonists. Other works include a second trilogy, A Prisoner of Grace (1952), Except the Lord (1953), and Not Honour More (1955).

caryatid \,kar-e-'a-t3d\ Supporting column sculpted in the form of a draped female figure. Caryatids first appeared in three small buildings (treasuries) at Delphi (550-530 bc). The most celebrated example is the caryatid porch of the Erechtheum (421-406 bc), with six figures, on the Acropolis (see acropolis) of Athens. Caryatids are sometimes called korai (“maidens”). Their male counterpart is the ATLAS.

Casa Grande Vka-s9-'gran-da\ Ruins National Monument

Archaeological site, southern Arizona, U.S. Designated a national monument in 1918, it occupies 448 acres (181 hectares). The site’s pre-Columbian ruins are dominated by the Casa Grande (“Big House”), a multistory building built by Salado Indians in the 14th century; it is the only surviving building of its type. Nearby are partially excavated village sites established much earlier by Hohokam Indians (see Hohokam culture).

Casablanca Coastal city (pop., 1994: 2,940,623), western Morocco. It occupies the site of the ancient city of Anfa, destroyed by the Portuguese in 1468. The Portuguese returned in 1515 and built a new town, Casa Branca (“White House”). Abandoned after an earthquake, it was occupied by a Moroccan sultan in 1757. European traders, including the French, began to settle there. In 1907, after French citizens were murdered there, French forces occupied the town. During the subsequent French protectorate, it became Morocco’s chief port. Since then, its growth and development have been continuous. In World War II (1939 — 45) it surrendered to the Allied Powers in 1942, and in 1943 the Casablanca Conference was held there.

Casablanca Conference (Jan. 12-23, 1943) Meeting during World War II at Casablanca, Morocco, between Franklin Roosevelt and Winston Churchill. They planned future global military strategy for the Western allies, reaching agreement on such issues as the invasion of Sicily, operations in the Pacific theatre, and the concentrated bombing of Germany. Most importantly, they issued a demand for an “unconditional surrender” from Germany, Italy, and Japan.

Casals \k3-'salz\, Pablo (Carlos Salvador Defillo) orig. Pau Casals (b. Dec. 29, 1876, Vendrell, Spain — d. Oct. 22, 1973, Rio Piedras, PR.) Spanish (Catalan)-born U.S. cellist and conductor. He received early instruction from his organist father and took up the cello and composition in his teens. A romantic who eschewed the drier, literal interpretations of modernism, Casals established an innovative technique employing more flexible fingering positions and freer bowing. He performed internationally as soloist, in a trio with Alfred Cortot (1877-1962) and Jacques Thibaud (1880-1953), and from the 1920s as a conductor. Refusing to return to Spain after Francisco Franco took power, he ulti-

mately made his home in Puerto Rico.

Casamance \,ka-za-'ma n s\ River River, Senegal. Rising in southern Senegal, it flows west between The Gambia and Guinea-Bissau and empties into the Atlantic Ocean after a course of about 200 mi (322 km). Only some 80 mi (130 km) of the river are navigable.

Casanova \ I ka-s9-'no-v9\ / Giovanni Giacomo (b. April 2, 1725, Venice — d. June 4, 1798, Dux, Bohemia) Italian ecclesiastic, writer, soldier, spy, and diplomatist. Expelled from a seminary for scandalous conduct, he launched a dissolute career that took him throughout Europe. In Venice in 1755 he was denounced as a magician and imprisoned; he escaped and fled to Paris, where he mingled with the aristocracy. Fleeing from creditors, he took the name Chevalier de Seingalt and traveled again before returning to Venice in 1774 to become a spy for the Venetian inquisitors of state. He spent his late years (1785-98) as librarian to the Count von Waldstein in Bohemia. His huge autobiography, first published in 12 volumes in 1825-38, gives a splendid picture of 18th-century Europe; it established his reputation as an extraordinary seducer of women.

Casas, Bartolome de las See Bartolome de Las Casas

Cascade Range Mountain range, western U.S. A continuation of the Sierra Nevada, it extends north from Mount Lassen in northeastern California across Oregon and Washington for 700 mi (1,100 km). Its highest elevation is Mount Rainier. Some of the summits, including Mount St. Helens, have erupted in the recent past. The Lewis and Clark Expedition passed through the range in the Columbia River Gorge. Its northern continuation in British Columbia is known as the Coast Mountains. See also North Cascades National Park.

CASE in full computer-aided software engineering Use of

computers in designing sophisticated tools to aid the software engineer and to automate the software development process as much as possible. It is particularly useful where major software products are designed by teams of engineers who may not share the same physical space. CASE tools can be used for simple operations such as routine coding from an appropriately detailed design in a specific programming language, or for more complex tasks such as incorporating an expert system to enforce design rules and eliminate software defects and redundancies before the coding phase.

Case, Steve orig. Stephen McConnell Case (b. Aug. 21, 1958, Honolulu, Hawaii, U.S.) U.S. businessman. In 1985 he cofounded Quantum Computer Services, which was renamed America Online, Inc. (AOL), in 1991. As chairman and CEO of the company, he developed it into the world’s foremost Internet service provider and helped turn the Internet into a mass medium. In 2001 he became the CEO of the newly formed AOL Time Warner Inc. (later Time Warner Inc.) but resigned the post in 2003.

Casement, Sir Roger (David) (b. Sept. 1, 1864, Kingstown, County Dublin, Ire. — d. Aug. 3, 1916, London, Eng.) British civil servant and Irish rebel. As British consul in Africa (1895-1904) and Brazil (1906-11), he became famous for his reports revealing white traders’ cruel exploitation of native labour in the Congo and in the Putumayo River region of Peru. Ill health forced his retirement to Ireland (1912), where

he joined the Irish nationalists and helped form the Irish National Volunteers. After World War I broke out, he sought German support for the Irish independence movement. For his additional intrigue in the Easter Rising, he was convicted of treason and hanged. His execution made him an Irish martyr in the revolt against British rule in Ireland.

cash flow Financial and accounting concept. Cash flow results from three major groups of activities: operating activities, investing activities, and financing activities. A cash-flow statement differs from an income statement in reflecting actual cash on hand rather than money owed (accounts receivable). Its purpose is to throw light on management’s use of its available financial resources and to help in evaluating a company’s liquidity.

Cash, Johnny orig. J.R. Cash (b. Feb. 26, 1932, Kingsland, Ark., U.S. — d. Sept. 12, 2003, Nashville, Tenn.) U.S. singer and songwriter. He learned guitar and began writing songs during military service in the early 1950s. Settling in Memphis, he earned regular appearances on Louisiana Hayride and the Grand Ole Opry with hits such as “Hey, Porter,” “Folsom Prison Blues,” and “I Walk the Line.” By 1957 Cash was acknowledged the top country music artist. His popularity waned for a time because of health and drug addiction problems, but his album Johnny Cash at Folsom Prison (1968) led to his rediscovery by a wider audience. In 1968 he married June Carter of the Carter Family, with whom he had worked since 1961. In 1994 he released American Recordings, which was a critical and popular success and won him a new generation of fans. His later albums include American IV: The Man Comes Around (2002). Cash was inducted into the Country Music Hall of Fame in 1980 and the Rock and Roll Hall of Fame in 1992. His autobiographies Man in Black and Cash (cowritten with Patrick Carr) were published in 1975 and 1997, respectively.

cashew Edible seed or nut of Anacardium occidentale, a tropical and subtropical evergreen shrub or tree in the sumac family, native to tropical Central and South America.

Important chiefly for its nuts, the tree

Cashew apples (hypocarp) and nuts of the domesticated cashew tree (Anacardium occidentale).

W.H. HODGE

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also produces wood used for shipping crates, boats, and charcoal, and a gum similar to gum arabic. Related to poison ivy and poison sumac, it must be handled with care. The two-shelled nut is shaped like a large, thick bean. A brown oil between the two shells blisters human skin and is used as a lubricant and an insecticide and in the production of plastics. The nut is rich and distinctively flavoured.

cashmere Animal-hair fibre forming the downy undercoat of the Kashmir goat. The fibre became known for its use in beautiful shawls and other handmade items produced in Kashmir, India. The fibres have diameters finer than those of the best wools. Natural colour is usually gray or tan but ranges from white to black. Cashmere fabric is warm and comfortable and has excellent draping qualities and soft texture; it is used mainly for fine coat, dress, and suit fabrics and for high-quality knitwear and hosiery. A sweater requires the fleece of 4-6 goats; an overcoat uses that of 30-40. Because world production is small and gathering and processing are costly, cashmere is a luxury fibre.

Casimir Yka-zo-.mirX III known as Casimir the Great Polish Kazimierz Weilki (b. April 30, 1310, Kujavia, Pol. — d. Nov. 5, 1370) King of Poland (1333-70). He was the son of Wladyslaw I, who revived the Polish kingship, and he continued his father’s quest to make Poland a power in central Europe. He crafted treaties with Hungary, Bohemia, and the Teutonic Order and acquired Red Russia and Masovia by diplomacy. Casimir also arranged a series of dynastic alliances that tied Poland to many royal European families. He codified Teutonic law, gave new towns self-government under the Magdeburg Law, and founded the University of Krakow.

Casimir IV known as Casimir Jagiellonian \yag-yel-'lo-ne-3n\ Polish Kazimierz Jagiellonczyk (b. Nov. 30, 1427 — d. June 7, 1492) Grand duke of Lithuania (1440-92) and king of Poland (1447-92). He became ruler of Lithuania by will of the boyars and king of Poland on his brother’s death. He sought to preserve the political union between Poland and Lithuania and to recover the lost lands of old Poland. Through his own marriage to Elizabeth of Habsburg and the marriages of his children, he formed alliances with various European royal houses and built the Jagiellon dynasty. The great triumph of his reign was the effective destruction of the Teutonic Order (1466), which brought Prussia under Polish rule.

casino Building or room used for gambling. The term originally referred to a public hall for music and dancing, but by the late 19th century it had come to denote a gaming house, particularly one in which card and dice games were played. Today casinos are places where gamblers can risk their money against a common gambler (called the banker or house), and they have an almost uniform character throughout the world. One of the oldest and best-known casinos is that at Monte Carlo (Monaco), founded in 1861. Others include those at Cannes and Nice (France), Corfu (Greece), Baden-Baden (Germany), Rio de Janeiro (Brazil), and Las Vegas and Reno (Nevada, U.S.). Casinos in Havana (Cuba) were confiscated by the Castro government after the 1959 revolution, spelling the end of a flourishing gambling scene that rivaled Las Vegas. Nevada has long had casino gambling, but other U.S. states prohibited it; that ban was

ended when a casino opened in Atlantic City, N.J., in 1978. From the 1980s casinos began appearing on American Indian reservations, which are not subject to state antigambling statutes, and casino gambling expanded vastly in the U.S. as gambling became legal in more states, particularly as a riverboat operation. In the late 1990s Internet gambling sites permitted players to play casino games such as roulette and blackjack. These virtual casinos usually offered the option of playing against other players or only against the house.

Casper City (pop., 2000: 49,644), east-central Wyoming, U.S., on the North Platte River. Founded in 1888, it was located on the Oregon Trail and the Pony Express route. The discovery of oil in the 1890s began an oil boom, and the oil fields of the Teapot Dome scandal were nearby. Casper's economy is based on the production of oil and natural gas and the manufacture of oil-field equipment. Mining (uranium, coal, bentonite) and cattle and sheep raising also are important.

Caspersson \kas-'per-,s6n\, Torborn Oskar (b. Oct. 15, 1910, Motala, Swed.) Swedish cell biologist and geneticist. After receiving his medical degree from the University of Stockholm in 1936, he initiated the use of the ultraviolet microscope to determine the nucleic acid content of cellular structures such as the nucleus and nucleolus. He theorized that nucleic acids must be present for protein synthesis to occur. He was the

first to perform cellular chemical studies on the giant chromosomes found in insect larvae. He also investigated the role of the nucleolus in protein synthesis.

Caspian Sea Inland salt lake between Europe and Asia, bordering Azerbaijan, Russia, Kazakhstan, and Iran. With a basin 750 mi (1,200 km) long and up to 200 mi (320 km) wide and an area of 149,200 sq mi (386,400 sq km), it is the largest inland body of water in the world. Though it receives many rivers, including the Volga, Ural, and Kura, the sea itself has no outlet. It was important as a commercial route in the premodern era, when it formed part of the Mongol-Baltic trade route for goods from Asia. It is now a major source of petroleum. Its numerous ports include Baku in Azerbaijan and Bandar-e Anzall and Bandar-e Torkaman in Iran.

Cass, Lewis (b. Oct. 9, 1782, Exeter, N.H., U.S. — d. June 17, 1866, Detroit, Mich.) U.S. politician. He fought in the War of 1812 and served as governor of Michigan Territory (1813-31). As secretary of war (1831-36) under Pres. Andrew Jackson, he directed the conduct of the Black Hawk and Seminole wars. He served as U.S. minister to France (1 836—42). In the U.S. Senate (1845^18, 1849-57), he supported westward expansion and the Compromise of 1 850. He was the Democratic nominee in the presidential election of 1848, which he lost to Zachary Taylor. He later served as secretary of state (1857-60) but resigned when Pres. James Buchanan took no action to counter the secession of the Southern states.

Cassandra In Greek mythology, the daughter of King Priam of Troy. Apollo promised her the gift of prophecy if she would grant his desires; she accepted the gift but rebuffed the god, who took his revenge by ordaining that her prophecies should never be believed. She predicted the fall of Troy and the death of Agamemnon, but her warnings went unheeded. Given as part of the war spoils to Agamemnon, she was murdered with him.

Cassatt \ko-'sat\, Mary (b. May 22, 1844, Allegheny City, Pa., U.S. — d. June 14, 1926, Chateau de Beaufresne, near Paris, France) U.S. painter and printmaker, active in Paris. She spent her early years traveling in Europe with her wealthy family. After attending the Pennsylvania Academy of the Fine Arts (1860-65) she later studied in Paris, copying Old Masters. In 1874 Cassatt chose Paris as her permanent residence and established her studio there. She shared with the Impressionists an interest in experiment and in the use of bright colours inspired by the out-of-doors. Edgar Degas became her friend, and at his request she exhibited with the Impressionists. She portrayed scenes of everyday life, particularly images of mothers and children, and was skilled at drawing and printmaking. Some of her best works were executed in pastel. Through her social contacts with wealthy private collectors, she promoted Impressionism in the U.S. and exerted a lasting influence on U.S. taste.

cassava \k3-'sa-v3\ or manioc or yuca Tuberous edible perennial plant (. Manihot esculenta) of the spurge family, from the New World tropics. It is cultivated for its tuberous roots, from which cassava flour, breads, tapioca, a laundry starch, and an alcoholic beverage are derived. It has conspicuous, almost palmate (fan-shaped) leaves and fleshy roots. Different varieties range from low herbs through many-branched shrubs to slender, unbranched trees adapted to diverse habitats.

Cassavetes X.ka-so-'ve-tezV John (b. Dec. 9, 1929, New York, N.Y., U.S. — d. Feb. 3, 1989, Los Angeles, Calif.) U.S. film director and actor. He acted in films and in television dramas before making his directorial debut with the critically praised Shadows (1961), a low-budget independent film in the cinema verite style. He played featured roles in such films as The Dirty Dozen (1967) and Rosemary’s Baby (1968) and returned to directing independent films, including Faces (1968), Husbands (1970), and A Woman Under the Influence (1974), which dramatized marital problems.

cassia Vka-sho\ Spice, also called Chinese cinnamon, consisting of the aromatic bark of the Cinnamomum cassia plant, of the laurel family. Similar to true cinnamon bark, cassia bark has a more pungent, less delicate flavor and is thicker. It is used as a flavoring in cooking. Whole buds, the dried, unripe fruits of C. cassia and C. loureirii, taste like the bark and are added to foods for flavoring. Confusion sometimes arises with another group of plants because Cassia is the name of an extensive genus of legumes, the source of various medicinal products and of senna leaves.

Cassidy, Butch orig. Robert Leroy Parker (b. April 13, 1866, Beaver, Utah, U.S. — d. 1909?, Concordia Tin Mines, near San Vicente,

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Bol.?) U.S. outlaw. Taking his name from an older outlaw mentor, Cassidy was a cattle rustler and a robber from the mid- 1880s. In 1900 he became the criminal partner of Harry Longabaugh, the “Sundance Kid” (1870-

1909?), whose nickname derived from a town where he had once been imprisoned. They became the foremost members of the Wild Bunch, a group of bank and train robbers. The two eluded Pinkerton detectives by escaping to South America in 1901. They bought a ranch in Argentina but returned to a life of outlawry in 1906. In 1909, trapped by soldiers in Bolivia, Sundance was mortally wounded, and Cassidy shot himself. The time, place, and circumstances of their deaths vary widely in different accounts.

Cassini, Gian Domenico (b. June 8, 1625, Perinaldo, Republic of Genoa — d. Sept. 14, 1712, Paris, France) Italian-born French astronomer. His early studies were mainly observations of the Sun, but, after obtaining more powerful telescopes, he turned his attention to the planets. He calculated Jupiter's and Mars's rotational periods and compiled a table of the positions of Jupiter's satellites. His observations of the Moon (1671 — 79) led to his compiling a large map. In 1683, after a study of the zodiacal light, he concluded it was of cosmic origin. He discovered four of Saturn's moons: Iapetus (1671), Rhea (1672), Tethys (1684), and Dione (1684). The dark gap between two of Saturn's main rings (Cassini's division) is named for him.

Cassiodorus \ l ka-se-o- > dor-os\ in full Flavius Magnus Aurelius Cassiodorus (b. 490, Scylletium, Bruttium, kingdom of the Ostrogoths — d. c. 585, Vivarium Monastery, near Scylletium) Historian, statesman, and monk who helped preserve Roman culture after the collapse of the Roman Empire. He was secretary to Theodoric and later held other high imperial offices. Soon after 540 he founded a monastery to perpetuate the culture of Rome. He collected pagan and Christian manuscripts and had the monks copy them, establishing a practice continued in later centuries. His own works included the Chronicon, a history of mankind to 519; De anima, on the soul after death; and Institutiones divinarum et saecularium litterarum, on the study of scripture and the seven liberal arts.

Cassirer \ka-'sir-9r\, Ernst (b. July 28, 1874, Breslau, Silesia, Ger. — d. April 13, 1945, New York, N.Y., U.S.) German philosopher and educator. He taught at the University of Berlin (1905-19) and the University of Hamburg (1919-33) before the rise of Nazism forced him to flee to Sweden and the U.S. Cassirer's philosophy, based primarily on the work of Immanuel Kant, expanded that philosopher's doctrines concerning the ways in which human experience is structured by innately existing concepts. After examining various forms of cultural expression, Cassirer concluded that man is uniquely characterized by his ability to use the "symbolic forms" of myth, language, and science to structure his experience and thereby to understand both himself and the natural world. His most important original work is The Philosophy of Symbolic Forms (1923-29); he also wrote works on Kant, G.W. Leibniz, Renaissance cosmology, and the Cambridge Platonists.

Cassius \'kash-os\ (Longinus), Gaius (d. 42 bc, near Philippi, Macedonia) Roman general and administrator. He fought alongside Pompey the Great against Julius Caesar but was reconciled with Caesar after Pompey' s defeat. Motivated by jealousy and bitterness, he joined Brutus in the successful conspiracy to assassinate Caesar (44 bc). Forced to leave Rome after the assassination, he went to Syria, and there he ousted the Roman governor (43). With Brutus he raised an army in Macedonia to challenge the Second Triumvirate. Defeated at the Battle of Philippi by Mark Antony, he had his freedmen slay him. He was lamented by Brutus as "the last of

the Romans.”

cassone \ko-'so-na\ or marriage chest Chest, usually of wood, intended to contain a bride’s dowry or to be given as a wedding present. It was the most elaborately decorated piece of furniture in Renaissance Italy. In the 15th century, wealthy Florentine families employed artists such as Sandro Botticelli and Paolo Uccello to decorate cassoni with paintings. They were often made in pairs, bearing the respective coats of arms of the bride and groom. Though cassoni were made in many countries, the finest come from Italy.

cassowary Vka-s3-,wer-e\ Any of several species of ratite (family Casuariidae) of the Australo-Papuan region. Related to the emu, it has been known to kill humans with slashing blows of its feet, which have long, daggerlike claws on the innermost toe. It has a featherless blue head protected by a bony crest and has a black body (immature birds are brownish). It moves rapidly along narrow tracks in the bush. Cassowaries eat fruit and small animals. The largest species is the common, or southern, cassowary (Casuarius casuarius), which stands almost 5 ft (1.5 m) tall.

cast iron Alloy of iron that contains 2-4% carbon, along with silicon, manganese, and impurities. It is made by reducing iron ore in a blast furnace (cast iron is chemically the same as blast-furnace iron) and casting the liquid iron into INGOTS called pigs. Pig iron is remelted, along with scrap and alloying elements, in cupola furnaces and recast into molds for a variety of products. In the 18th– 19th centuries, cast iron was a cheaper engineering material than wrought iron (not requiring intensive refining and hammering). It is more brittle and lacks tensile strength. Its compressive (load-bearing) strength made it the first important structural metal. In the 20th century, steel replaced it as a construction material, but cast iron still has industrial applications in automobile engine blocks, agricultural and machine parts, pipes, hollowware, stoves, and furnaces. Most cast iron is either so-called gray iron or white iron, the colours shown by fracture; gray iron contains more silicon and is less hard and more machinable than white iron. Both are brittle, but malleable cast iron (produced by prolonged heat-treating), first made in 18th-century France, was developed into an industrial product in the U.S. Cast iron that is ductile as cast was invented in 1948. The latter now constitutes a major family of metals, widely used for gears, dies, automobile crankshafts, and many other machine parts.

Castagno \ka-'sta-nyd\, Andrea del orig. Andrea di Bartolo (b.

c. 1421, San Martino a Corella, Republic of Florence — d. Aug. 19, 1457, Florence) Italian painter active in Florence. Little is known of his early life, and many of his paintings have been lost. His earliest dated works are frescoes in the church of San Zaccaria in Venice (1442). In 1447 he began his greatest work, a series of monumental frescoes depicting the Last Supper and other scenes of Christ's Passion for the convent of Sant' Apollonia in Florence (now a museum). His use of pictorial illusionism and scientific perspective, as well as the powerful, sculptural form of his figures, established him as one of the most influential Renaissance painters of the 15th century.

caste Any of the ranked, hereditary, endogamous (see exogamy and endogamy) occupational groups that constitute traditional societies in certain regions of the world, particularly among Hindus in India. There caste is rooted in antiquity and specifies the rules and restrictions governing social intercourse and activity. Each caste has its own customs that restrict the occupations and dietary habits of its members and their social contact with other castes. There are about 3,000 castes, or jatis (broadly, "form of existence fixed by birth"), and more than 25,000 subcastes in India. They are traditionally grouped into four major classes, or varnas ("colours"). At the top are the Brahmans, followed by the Kshatriyas, Vaishyas, and Shudras. Those with the most defiling jobs (such as those who dispose of body emissions and dead animals) are ranked beneath the Shudras. Considered untouchable, they were simply dubbed as "the fifth" (panchama) category. Although a great many spheres of life in modem India are little influenced by caste, most marriages are nevertheless arranged within the caste. This is in part because most people live in rural communities and because the arrangement of marriages is a family activity carried out through existing networks of kinship and caste.

caste \'kast\ In biology, a subset of individuals within a colony of social animals (chiefly ants, bees, termites, and wasps) that has a specialized function and is distinguished from other subsets by morphological and anatomical differences. Typical insect castes are the queen (the female responsible for reproduction), workers (the usually sterile female caretakers of the queen, eggs, and larvae), soldiers (defenders of the colony; also sterile females), and sometimes drones (short-lived males). The dif-

Common, or southern, cassowary
(Casuarius casuarius).

ANTHONY MERCIECA FROM ROOT RESOURCES

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ferentiation of larvae into various castes is often determined by diet, though hormonal and environmental factors can also play a role.

Castelo Branco \kash-'tel-u- , bra n q-kti\, Camilo, viscount of Correia Botelho (b. March 16, 1825, Lisbon, Port. — d. June 1, 1890, Seide) Portuguese novelist. An orphan from a family with a tendency to insanity, he studied medicine and theology before beginning to write. While imprisoned for eloping with another man's wife, he wrote his best-known work, Amor de perdigao (1862; "Fatal Love"), about a thwarted love that leads to crime and exile. His 58 novels, many mirroring his passionate life, range from Romantic melodrama to realism. His best works include O romance d'um homem rico (1861; "The Love Story of a Rich Man") and O retrato de Ricardina (1868; "Portrait of Ricardina"). Ennobled in 1885, he committed suicide five years later.

Castiglione V.kas-tel-'yo-naV, Baldassare (b. Dec. 6, 1478, Casatico, near Mantua — d. Feb. 2, 1529,

Toledo) Italian diplomat, courtier, and writer. Born into a noble family, he was attached to the courts of Mantua and Urbino and later entered papal service. He is remembered for The Courtier (1528). Written in the form of a philosophical dialogue, it describes the conduct of the perfect courtier, the qualities of a noble lady, and the ideal relationships between the courtier and his prince. Immediately successful in Italy and beyond, it became a manual for those aspiring to aristocratic manners during the Renaissance.

Castile \ka-'stel\ Spanish Castilla \ka-'ste-lya\ Traditional region, peninsular Spain. Comprising several modern provinces, its northern part is called Old Castile and its southern part New Castile. Castilian territory was united under Leon by Feman Gonzalez in the 10th century. Though it separated from Leon in the 12th century, it was reunited with it by Ferdinand III in 1230. The Spanish part of the kingdom of Navarra was annexed by Castile in 1512, thus completing the formation of modern Spain. Castile remains Spain's centre of political and administrative power. See also Castile-Leon; Castile-La Mancha.

Castile-La Mancha Spanish Castilla La Mancha Autonomous community (pop., 2005 est.: 1,894,667) and historic region, central Spain. Established in 1982, it encompasses the provinces of Toledo, Ciudad Real, Cuenca, Guadalajara, and Albacete and covers an area of 30,681 sq mi (79,463 sq km). Its capital is Toledo. The watershed of the low-lying Toledo Mountains bisects the region; land to the north is drained by the Tagus River, and the plains of La Mancha to the south are drained by the Guadiana. In the 20th century, emigration to Madrid depleted the population. Agriculture dominates the economy. See Castile; Miguel de Cervantes.

Castile-Leon Spanish Castilla y Leon Autonomous community (pop., 2001: 2,456,474) and historic region, northern Spain. Established in 1983, it encompasses the provinces of Valladolid, Burgos, Leon, Salamanca, Zamora, Polencia, and Segovia and covers an area of 36,380 sq

mi (94,224 sq km). Its capital is Valladolid. It occupies the elevated Central Plateau and is drained by the Douro River, which bisects the region. The Cantabrian Mountains rise to the north. The area's population experienced periods of decline in the 20th century, with notable emigration from the countryside to the provincial capitals. Its economy is largely agricultural. See also Castile.

Castilho \kash-'tel-yii\, Antonio Feliciano de (b. Jan. 28, 1800, Lisbon — d. June 18, 1875, Lisbon) Portuguese poet. Though blind from childhood, he became a classical scholar and by age 16 was publishing poems, translations, and pedagogical works. With his Obras completas (1837; "Complete Works"), he became a literary figure in Lisbon. As director of the important journal O panorama and later of the major cultural review Revista universal Lisbonense, he became a central figure in the Portuguese Romantic movement. After 1850 he gradually returned to a genteel traditionalism. His lifeless style so dominated literary taste that it provoked a rebellion by younger writers, and he was dethroned as literary arbiter.

Castillo de San Marcos \ka-'ste-yo-da-san-'mar-kos\ National Monument Historic site, northeastern Florida, U.S. Established in 1924, it is the 25-acre (10-hectare) site of the oldest masonry fort in the U.S., built by the Spanish (1672-95) to protect St. Augustine. The fort played an important role in the Spanish-English struggle for the Southeast (c. 1670-1763). In the 19th century it served as a U.S. military prison.

casting Pouring of molten metal into a mold, where it solidifies into the shape of the mold. The process was well established in the Bronze Age, when it was used to form bronze pieces now found in museums. It is particularly valuable for the economical production of complex shapes, ranging from mass-produced parts for automobiles to one-of-a-kind production of statues, jewelry, or massive machinery. Most steel and iron castings (see cast iron) are poured into silica sand. For metals of lower melting point, such as aluminum or zinc, molds can be made of another metal or of sand. See also die casting, founding, investment casting, lost-wax CASTING, PATTERNMAKING.

castle Medieval European stronghold, generally the fortified dwelling of the king or lord of the territory in which it stood. The castle developed rapidly in western Europe from the 9th century. In form it was somewhat sprawling compared to later fortified buildings. The castle's enceinte (outer wall) was surrounded by one or more moats, which were crossed by drawbridges that could be raised from the inner side. The gateway itself was heavily protected and often defended by a barbican, or watchtower. One or more baileys, or walled courtyards, surrounded the donjon. The age of the medieval castle came to an end with the increasing use of firearms in the 15th- 16th centuries.

Castle, Vernon and Irene orig. Vernon Blythe and Irene Foote (respectively b. May 2, 1887, Norwich, Norfolk, Eng. — d. Feb. 15, 1918, Fort Worth, Texas, U.S.; b. 1893, New Rochelle, N.Y., U.S.— d. Jan. 25, 1969, Eureka Springs, Ark.) U.S. husband-and-wife ballroom dance team. Vernon moved to the U.S. in 1906 and married Irene in 1911. They gained worldwide popularity for their graceful style, and they introduced such dances as the one-step, fox-trot, turkey trot, castle polka, castle walk, and hesitation waltz and popularized several others. Irene is credited with creating the fashion for bobbed hair. Following Vernon's death

in an airplane crash, Irene retired from dancing.

Castlereagh Vka-s3l-,ra\ District (pop., 2001: 66,488), Northern Ireland. Located southeast of Belfast, it was established in 1973. The area was settled in the 14th century by the O'Neill clan of Ulster, from whose main stronghold, Grey Castle (no longer extant), it takes its name. It is closely linked to eastern Belfast, the district seat, where many of its residents are employed.

Castlereagh, Robert Stewart, Viscount (b. June 18, 1769, Dublin, Ire. — d. Aug. 12, 1822, London, Eng.) British politician. He was elected to the Irish Parliament in 1790 and later served in the British Parliament (1794-1805, 1806-22). As chief secretary for Ireland (1798—1801), Castlereagh singlehandedly forced the Act of Union through the Irish Parliament in 1800. He served as Britain's secretary for war (1805—06, 1807-09) and as secretary for foreign affairs and leader of the House of Commons (1812-22). Considered one of the most distinguished foreign secretaries in British history, he played a leading role in bringing together the Grand Alliance that overthrew Napoleon and in deciding the form of the peace settlements at the Congress of Vienna. Beset with paranoia and believing that he was being blackmailed, he eventually committed suicide.

Castor and Pollux See Dioscuri

castor-oil plant Large plant (Ricinus communis) of the spurge family, probably native to Africa and naturalized throughout the tropics. It is grown commercially for the pharmaceutical and industrial uses of its oil and for use in landscape gardening because of its handsome, giant, fanlike leaves. The bristly, spined, bronze-to-red clusters of fruits are attractive but are often removed

before they mature because of the Castor-oil plant (Ricinus communis). poison concentrated in their mottled, KENNETH and brenda formanek/eb inc.

Baldassare Castiglione, detail of a portrait by Raphael, 1516; in the Louvre, Paris

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beanlike seeds. There are hundreds of natural forms and many horticultural varieties of this species.

castration or neutering Removal of the testes. The procedure stops most production of the hormone testosterone. If done before puberty, it prevents the development of functioning adult sex organs. Castration after sexual maturity makes the sex organs shrink and stop functioning, ending sperm formation and sexual interest and behaviour. Livestock and pets are castrated to keep them from reproducing (see sterilization) or to create a more docile animal. In humans, castration has been used for both cultural (see eunuch, castrato) and medical (e.g., for testicular cancer) reasons.

castrato \ka-'stra-,to\ Male soprano or alto voice produced as a result of castration before puberty. The castrato voice was introduced in the Vatican’s Sistine Chapel in the 16th century, when women were still banned from church choirs as well as the stage. It reached its greatest prominence in 17th- and 18th-century opera. The illegal and inhumane practice of castration, largely practiced in Italy, could produce a treble voice of extraordinary power, attributable to the lung capacity and physical bulk of the adult male. The unique tone quality and the ability of intensively trained singers to execute virtuosic passagework made castrati the rage among opera audiences and contributed to the spread of Italian opera. Most male singers in 18th-century opera were castrati; the most famous bore the stage names Senesino (Francesco Bemardi; died c. 1750), Caffarelli (Gaetano Majorano; 1710-1783), and Farinelli. Castrati sang in the Sistine Chapel choir until 1903.

Castries \ka-'stre, 'kas-,tre\ Seaport (pop., 1997 est.: 16,187), capital of Saint Lucia. Located on the island’s northwestern coast, its fine harbour is Saint Lucia’s chief port. A fortress on Mount Fortune (852 ft [260 m]) overlooks the town. Castries is a gateway for tourists visiting the island.

Castro (Ruz), Fidel (b. Aug. 13, 1926/27, near Biran, Cuba) Political leader of Cuba (from 1959). Son of a prosperous sugar planter, he became a lawyer and worked on behalf of the poor in Havana. He was a candidate for Cuba’s legislature when Gen. Fulgencio Batista overthrew the government in 1952. He organized a rebellion against Batista in 1953, but it failed; captured, he served time in prison and then went to Mexico, where he and others, including Che Guevara, continued to plot Batista’s overthrow. Castro led an armed expedition back to Cuba in 1956; most of his men were killed, but a dozen survivors took refuge in the mountains, where they gradually managed to organize guerrillas throughout the island. In 1959 Batista was forced to flee the country. Castro nationalized private commerce and industry and expropriated U.S. -owned land and businesses, vastly expanded health services and eliminated illiteracy, and ruthlessly suppressed opposition, outlawing all political groups but the Communist Party. The U.S. attempted to bring about his overthrow and failed (see Bay of Pigs invasion), precipitating the Cuban missile crisis. Castro exercised total control of the government and economy, which was increasingly dependent on subsidies from the Soviet Union. The Soviet Union’s collapse (1991) devastated Cuba’s economy, and Castro has attempted to replace its former revenues by encouraging tourism.

Castro y Bellvis Vkas-tro-e-beP-'vesX, Guillen de (b. 1569, Valencia, Spain — d. 1631, Madrid) Spanish playwright. Of his approximately 50 plays, the best-remembered is The Youth of the Cid (c. 1599), on which

Pierre Corneille based his Le Cid (1637). Castro’s play is notable for its naturalistic dialogue. He was one of the earliest playwrights to deal with the difficulties of marriage, as in The Unhappy Marriages of Valencia. He drew heavily on traditional Castilian ballads and based three of his plays on novels by Miguel de Cervantes.

casualty insurance Provision against loss to persons and property, covering legal hazards as well as those of accident and sickness. Major classes include liability, theft, aviation, workers' compensation, credit, and title. Liability insurance contracts may cover liability arising from use of an automobile, operation of a business, professional negligence (malpractice insurance), or property ownership. Credit insurance may cover the risk of bad debts from insolvency, death, and disability, the risk of loss of savings from bank failure, and the risk of loss of export credit due to commercial or political changes.

casuarina \,kazh-y3-'re-n9\ Any of the chiefly Australian trees that make up the genus Casuarina (family Casuarinaceae), which have whorls of scalelike leaves and segmented stems resembling horsetails. Several species, especially C. equisetifolia, are valued for their hard, dense, yellowish to reddish brown wood, which is strong and reputed to be resis-

tant to termite attack. Beefwood and ironwood are common names that reflect the wood’s colour and hardness.

cat or feline Any member of the family Felidae, the most highly specialized group of mammalian carnivores. Modern-type cats appeared in the fossil record about 10 million years ago. Cats in the genus Panthera (leopard, jaguar, tiger, and lion) roar but cannot purr, and their pupils are round. Other cats, including the snow leopard and cougar, can purr but do not roar; the pupil is usually vertical. Cats have sharp, retractable (except in the cheetah) claws, and their teeth are adapted for stabbing, anchoring, and cutting. They almost always land on their feet when they fall from a height. Most species are nocturnal, and their eyes are adapted for seeing in low light. Cats are known for their habit of grooming themselves with their rasplike tongue. Small cats have been domesticated for some 3,500 years (see domestic cat). Other cat species include the bobcat, CARACAL, LYNX, OCELOT, SERVAL, and WILDCAT.

CAT See computed axial tomography
cat bear See lesser panda

catacomb Subterranean cemetery of galleries with recesses for tombs. The term was probably first applied to the cemetery under St. Sebastian’s Basilica that was a temporary resting place for the bodies of Sts. Peter and Paul in the late 3rd century ad, but it came to refer to all the subterranean cemeteries around Rome. In addition to serving as burial sites, catacombs in early Christian Rome were the sites of funeral feasts celebrated in family vaults on the day of burial and on anniversaries. They were used as hiding places during times of persecution; Pope Sixtus II was supposedly captured and killed (ad 258) while hiding in the St. Sebastian’s catacomb during Valerian’s persecution. Catacombs are also found in Sicily and other parts of Italy, in Egypt, and in Lebanon.

Arched niche of a tomb with early Christian paintings of scenes from the Old and

New Testaments, in the catacomb on Via Latina, Rome

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Catalan \'ka-t3-,lan\ language Romance language spoken in eastern and northeastern Spain, chiefly Catalonia and Valencia, and in Andorra, the Balearic Isles, and the Roussillon region of France. Its literary tradition dates from the 12th century, when it was the official language of the kingdom of Aragon. As Catalonia achieved greater autonomy in the late 20th century, Catalan revived as the language of politics and education there. Its dialects, divided into an Occidental and an Oriental group, remain mutually intelligible. Catalan is related to the Occitan language of southern France and to Spanish.

Catalhiiyuk Vcha-.tal-hiE-'yuikA English foha-.tal-hii-'yukV Neolithic site, Anatolia. Located near Konya in southern Turkey, it was the centre of an advanced Neolithic culture. The earliest period of settlement is tentatively dated to c. 6700 bc and the latest to c. 5650 bc. Excavation of the religious quarter produced a series of shrines; the wall paintings have been linked with Upper Paleolithic art.

Catalonia Catalan Catalunya Spanish Cataluna Autonomous community (pop., 2001: 6,343,110) and historic region, northeastern

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Spain. It encompasses the provinces of Girona, Barcelona, Tarragona, and Lleida and covers an area of 12,399 sq mi (32,113 sq km). Its capital is Barcelona. The Pyrenees separate Catalonia from France; the Mediterranean Sea lies to the east. Its principal rivers, the Ter, Llobregat, and Ebro, all run into the Mediterranean. Catalonia was one of Rome’s first Spanish possessions. Occupied in the 5th century ad by the Goths, it was taken by the Moors in 712 and by Charlemagne in 795. After the unification of Spain (1469), Catalonia lost its centrality in Spanish affairs, and by the 17th century its conflict of interest with Castile- Leon led to the first of a series of separatist movements. Catalan nationalism became a serious force after 1876. In 1932 a compromise with the central government granted Catalonia autonomy; this was revoked with the 1939 Nationalist victory in the Spanish Civil War, and Francisco Franco’s government adopted a repressive policy toward Catalan nationalism. The reestablishment of democratic rule after Franco’s death again led to autonomy in 1979. Today it is the richest and most industrialized part of Spain.

catalpa \k9-'tal-p9\ Any of 11 species of trees in the genus Catalpa (family Bignoniaceae), native to eastern Asia, eastern North America, and the West Indies. Catalpas have large, attractive leaves and showy white, yellowish, or purplish flowers. The catalpa fruit is a long cylindrical pod bearing numerous seeds with white tufts of hair at each end. The common catalpa, C. bignonioides, yields a durable timber and is one of the most widely planted ornamental species.

catalysis \k3-'ta-b-s9s\ Modification (usually acceleration) of a chemical reaction rate by addition of a catalyst, which combines with the reactants but is ultimately regenerated so that its amount remains unchanged and the chemical equilibrium of the conditions of the reaction is not altered. Catalysts reduce the activation energy barrier between reactants and products. When more than one reaction is possible, a catalyst that accelerates only one reaction pathway selectively enhances the creation of its product. Catalysis is inhibited if the reactant or the catalyst is removed or altered by any of several types of agents (inhibitors). Catalysis in a single phase (e.g., the catalyst is dispersed in a liquid solution or gaseous mixture with the reactants) is homogeneous; that in more than one phase (e.g., the reactants are liquids and the catalyst a solid) is heterogeneous. Chemisorption, a type of heterogeneous catalysis, often involves bonding between the catalyst's solid surface and the reactant, changing the nature of the chemisorbed molecules. To make the accessible surface area as large as possible, such catalysts are finely powdered or highly porous solids. Catalysis is essential to the modern chemical industry. See also enzyme.

catalyst \'ka-t 3 l-3st\ Any substance of which a small proportion notably affects the reaction rate of a chemical reaction without itself being changed or consumed (see catalysis). One molecule may transform several million reactant molecules a minute. Catalysts may be gaseous, liquid, or solid; they may be inorganic compounds, organic compounds, or complex combinations. They tend to be highly specific, reacting with only one substance or a small set of substances. Substances that reduce the effectiveness of catalysts by altering them or blocking reactants' access to them are called catalyst inhibitors or catalyst poisons. Catalysts are essential to virtually all industrial chemical reactions, especially in petroleum refining and synthetic organic chemical manufacturing. Most solid catalysts are transition elements (metals) or their oxides in finely divided or porous form. In a car's catalytic converter, the platinum catalyst converts unburned hydrocarbons and nitrogen compounds to products less harmful to the environment. Water, especially saltwater, catalyzes oxidation (see oxidation-reduction) and corrosion. Enzymes are among the most active and selective catalysts known.

catalytic converter In automobiles, a component of emission control systems used to reduce the discharge of noxious gases from the internal-combustion engine. The catalytic converter consists of an insulated chamber containing pellets of catalyst through which the exhaust gases are passed. The exhaust's hydrocarbons and carbon monoxide are converted to water vapour and carbon dioxide.

catamaran Vka-ts-mo-.ranV Twin-hulled sailing and engine-powered boat. Its design was based on a raft of two logs bridged by planks used by peoples in the Indonesian archipelago, Polynesia, and Micronesia. Up to 70 ft (21 m) long, early catamarans were paddled by many men and used for travel, in war, and in recreation. Especially after the sail was added, voyages as long as 2,000 mi (3,700 km) were made. In the 1870s they sailed so successfully against monohulled boats that they were barred

from racing. The modern catamaran, which averages about 40 ft (12 m) in length, has been produced since 1950. They are very fast craft, achieving speeds of 20 mph (32 kph).

Catania \ka-'ta-nya\ City (pop., 2001 prelim.: 306,464), Sicily, Italy. It

was founded by Greeks in 729 bc at the foot of Mount Etna on the Gulf of Catania. Taken by the Romans in the First Punic War (263 bc), Catania was made a Roman colony by Octavian (later Augustus). Catanian Christians suffered under the emperors Decius and Diocletian; their martyrs included St. Agatha, patron saint of the city. Catania fell successively to the Byzantines, Arabs, and Normans, and it suffered devastation by earthquakes especially in 1169 and 1693. In World War II the city was severely damaged by bombing. Rebuilt, it is Sicily's second largest city and is an industrial and transportation centre.

Catanzaro \,ka-tand-'za-r6\ City (pop., 2001 prelim.: 93,540), capital of Calabria, southern Italy. Catanzaro lies near the Gulf of Squillace. It was probably founded in the 10th century by Byzantines. It was taken in 1059 by the Normans under Robert Guiscard. It played an important part in the Napoleonic Wars and in the movement for Italian unity. Catanzaro suffered severely from earthquakes in 1905 and 1907 and from bombing in World War II. It is an agricultural centre.

catapult Mechanism for forcefully propelling stones, spears, or other projectiles, in use since ancient times. Nearly all catapults employed in ancient and medieval artillery operated by a sudden release of tension on wooden beams or twisted cords of horsehair, gut, sinew, or other fibres. An exception was the medieval trebuchet, powered by a counterweight. Modem mechanisms using steam, hydraulic pressure, tension, or other force to launch gliders, aircraft, or missiles are also called catapults.

cataract Opacity of the eye's crystalline lens. Cataracts causing central visual-field defects are most likely to affect vision. Cataracts may occur in newborns and infants. Diabetes mellitus, prolonged exposure to ultraviolet rays, or trauma can cause them in adults, but they most often occur with age, resulting from gradual loss of transparency of the lens. Treatment is a surgical procedure to replace the lens with an artificial one.

catastrophe theory Branch of mathematics (considered a branch of geometry) that explores how gradual changes to a system produce sudden, drastic results (though usually not as dire as the name suggests). A simple example is how a plastic coffee stirrer subjected to gradually increasing pressure from both ends will suddenly buckle in one direction or another. Other "catastrophes" include optical phenomena such as reflection or refraction of light through moving water. More speculatively, ideas from catastrophe theory have been applied by social scientists to such situations as the sudden eruption of mob violence.

Catatumbo \,ka-ta-'tum-bo\ River River, northern South America. Rising in northern Colombia, it flows northeast across the Venezuelan border and the oil-rich Maracaibo lowland to empty into Lake Maracaibo after a course of 210 mi (338 km).

Catawba Vko-'to-bsN North American Indian people of South Carolina, U.S. The meaning of the name Catawba, which seems to have been applied after European contact to several small bands of peoples in the region of the Catawba River, is unknown. The peoples first encountered by Hernando de Soto subsisted principally by farming, harvesting com, beans, squash, and gourds. Fish and birds were also staples of their diet. They traded bowls, baskets, and mats to other native groups and, later, to colonists. Each village was governed by a council presided over by a chief. After contact with European settlers, disease and other factors diminished their numbers rapidly. In the 2000 U.S. census some 1,700

people identified themselves as of sole Catawba descent.

Catawba River River, southeastern U.S. Rising in North Carolina's Blue Ridge, it flows south into South Carolina, where it becomes the Wateree River. It is 220 mi (350 km) long. With the Wateree, it forms an important source of hydroelectric power for South Carolina.

catbird Any of several passerine species (family Mimidae) named for their mewing calls, which they use in addition to song. The North American catbird (Dumetella carolinensis) is 9 in. (23 cm) long and gray with a black cap. It is found in gardens and thickets. The black catbird (Melanoptila glabrirostris) is found in coastal Yucatan. Three species of the bowerbird family are also called catbirds; they are found in Australia, New Guinea, and nearby islands and do not build bowers but hold territories in the forest by loud singing.

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catch English round, or simple perpetual canon, for three or more unaccompanied voices. Catches were sung by men as a popular pastime in the 16th- 19th centuries. Catch texts were often humorous or ribald, and in some instances a pause in the melody in one voice was filled in by the notes and text of another, creating a pun or change of meaning, especially in the late- 17th-century Restoration period.

Cateau-Cambresis \ka-to-ka n -bra-'ze\, Treaty of (April 3, 1559) Agreement marking the end of the 65-year struggle (1494-1559) between France and Spain for the control of Italy. France gave up its claims to Italian territory, leaving Habsburg Spain the dominant power there. France returned Savoy and Piedmont to Spain's ally Emmanuel-Philibert of Savoy (1528-80) and restored Corsica to Genoa. Elsewhere, France retained Calais, which it had seized from England in 1558, and the bishoprics of Toul, Metz, and Verdun, taken from Emperor Charles V.

catechesis See kerygma and catechesis

catechism Manual of religious instruction usually arranged in the form of questions and answers and used to instruct the young, win converts, and testify to the faith. The medieval catechism concentrated on the meaning of faith, hope, and charity. Later catechisms added other subjects and became more important following the Reformation and the invention of the printing press. Martin Luther's Small Catechism (1529) added discussions of baptism and the Eucharist. John Calvin published a children's catechism in 1542. The Anglican catechism is included in the Book of Common Prayer. The Baltimore Catechism (1885) is the Catholic catechism best known in the U.S. In 1992 the Vatican issued a new universal Catechism of the Catholic Church.

catecholamine \ l ka-to-'ko-b- l men\ Any naturally occurring amine functioning as a neurotransmitter or hormone, including dopamine, norepinephrine, and epinephrine. All are derived from tyrosine and have a catechol

group (benzene ring with two hydroxyl groups) with an attached amine group. Neurons in the brain, in the adrenal gland, and in some sympathetic nerve fibres produce different catecholamines.

categorical imperative In Immanuel Kant's moral philosophy, an imperative that presents an action as unconditionally necessary (e.g., "Thou shalt not kill"), as opposed to an imperative that presents an action as necessary only on condition that the agent wills something else (e.g., "Pay your debts on time, if you want to be able to obtain a mortgage"). Kant held that there was only one formally categorical imperative, from which all specific moral imperatives could be derived. In one famous formulation, it is: "Act only according to that maxim by which you can at the same time will that it should become a universal law." See also deontological ethics.

categorical proposition In syllogistic, a proposition in which the predicate is affirmed or denied of all or part of the subject. Thus, categorical propositions are of four basic forms: "Every S is P," "No S is P," "Some S is P," and "Some S is not P." These are designated by the letters A, E, I, and O, respectively; thus, "Every man is mortal" is an A-proposition. Categorical propositions are to be distinguished from compound and complex propositions, into which they can enter as integral terms. In particular, they contrast especially with hypothetical propositions, such as "If every man is mortal, then Socrates is mortal."

caterpillar Larva of a butterfly or moth. Caterpillars have a cylindrical body consisting of 13 segments, with three pairs of legs on the thorax and "prolegs" on the abdomen. The head has six eyes on each side, short antennae, and strong jaws. Though not true worms, many caterpillars are called worms (e.g., the inchworm, or looper, and the cutworm). Caterpillar-like larvae are also found in other insect groups (e.g., sawflies and scorpionflies).

catfish Any of about 2,500 species of scale-less, mostly freshwater, fishes (order Siluriformes) related to carp and minnows and named for their whiskerlike barbels (fleshy feelers). All species have at least one pair of barbels on the upper jaw, and some have a pair on the snout and additional pairs on the chin. Many species possess spines that may be associated with venom glands. Found almost worldwide, they are generally bottom-dwelling scavengers that feed on almost any kind of plant or animal matter. Species vary from 1.5 in. to 15 ft (4 cm-4.5 m) long and may weigh up to 660 lbs (300 kg). Many small species are popular aquarium fishes; many large species are used for food.

Cathari Vka-tho-.rA or Albigensians \al-b3-'jen-se-onz\ Heretical Christian sect that flourished in Western Europe in the 12th— 13th century.

The Cathari adhered to the dualist belief that the material world is evil and that humans must renounce the world to free their spirits, which are good and long for communion with God. Jesus was seen as an angel whose human suffering and death were an illusion. Followers divided themselves into the "perfect," who had to maintain the highest moral standards, and ordinary "believers," of whom less was expected. By 1200 they had established 1 1 bishoprics in France and Italy. In an effort to stamp out their heresy, Pope Innocent III declared the Albigensian Crusade, in which the populace in Cathar regions was indiscriminately massacred. Persecution through the Inquisition, sanctioned by St. Louis IX, was even more effective, and when the Cathar stronghold of Montsegur fell in 1244,

most Cathari fled to Italy. The movement disappeared in the 15th century.

catharsis \k3-'thar-s9s\ Purging or purification of emotions through art. The term is derived from the Greek katharsis (“purgation,” “cleansing”), a medical term used by Aristotle as a metaphor to describe the effects of dramatic tragedy on the spectator: by arousing vicarious pity and terror, tragedy directs the spectator’s own anxieties outward and, through sympathetic identification with the tragic protagonist, purges them.

Cathay \ka-'tha\ Former name for China, especially northern China. The word is derived from Khitay, the name of a seminomadic people who dominated northern China in the 1 0th— 1 2th century. By the time of Genghis Khan, the Mongols had begun referring to northern China as Kitai (still the Russian word for China). The name may have been introduced to Europe by returning Franciscan friars c. 1254, but it was Marco Polo’s Travels 50 years later that put Cathay’s image before the European public.

cathedral Church, often large and magnificent, in which a residential bishop has his official seat. Cathedrals are usually embellished versions of early Christian basilicas; their construction, on an ever-larger scale, was a major preoccupation throughout Europe in the Middle Ages. Masonry vaulting replaced the earlier timber roofs, and the basilican plan grew more complex. Above the arches of the nave, and below the clerestory, was the triforium, an arcaded upper story that often contained vaulted tribune galleries open to the nave. The portion containing seats for the choir, usually east of the transept, was called the chancel. Between the chancel and the sanctuary (high altar) was the presbytery, a raised area occupied only by clergy. The chapter house, a popular feature of English cathedrals, was a chamber, typically octagonal, in which business was transacted. Small chapels, including the founder’s chantry and the Lady Chapel (dedicated to the Virgin Mary) were often added. Many cathedrals of the Ile-de-France region were remodeled to embody a chevet, or arc of radiating chapels, on the eastern wall, a feature reflected in England in Westminster Abbey and Canterbury Cathedral.

Cather Vka-thsrV Willa orig. Wilella Sibert Cather (b. Dec. 7, 1873, near Winchester, Va., U.S. — d. April 24, 1947, New York, N.Y.) U.S. novelist. Cather moved with her family to Nebraska at age 9; she returned east 12 years later, eventually settling in New York. The Troll Garden (1905), her first short-story collection, contains some of her best-known work. The novels O Pioneers! (1913) and My Antonia (1918), often judged her finest achievement, celebrate frontier spirit and courage. Song of the Lark (1915), Youth and the Bright Medusa (1920), and other works reflect the struggle of a talent to emerge from small-town provincialism. One of Ours (1922, Pulitzer Prize) and A Lost Lady (1923) mourn the loss of the pioneer spirit. Pioneers of earlier eras also inspired Death Comes for the Archbishop (1927) and Shadows on the Rock (1931).

Catherine I Russian Yekaterina Alekseyevna orig. Marta Skowronska (b. April 15, 1684 — d. May 17, 1727, St. Petersburg, Russia) Second wife of Peter I and empress of Russia (1725-27). A peasant woman of Baltic origin, she became Peter’s mistress in 1702. In 1703, after the birth of their first child, she was received into the Russian Orthodox church and rechristened. She married Peter in 1712 and in 1724 was crowned empress-consort. After Peter’s death (1725), she served two years as empress of Russia.

Catherine II Russian Yekaterina Alekseyevna orig. Sophie

Friederike Auguste, princess von Anhalt-Zerbst known as Catherine the Great (b. May 2, 1729, Stettin, Prussia — d. Nov. 17, 1796, Tsarskoye Selo, near St. Petersburg, Russia) German-born empress of Russia (1762-96). The daughter of an obscure German prince, she was chosen at age 14 to be the wife of the future Peter III. The marriage was a complete failure. Because her neurotic husband was incapable of ruling, the ambitious Catherine saw the possibility of eliminating him and governing Russia herself. After Peter became emperor in 1762, she con-

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spired with her lover, Grigory G., Count Orlov, to force Peter to abdicate (he was murdered soon after) and have herself proclaimed empress. In her 34-year reign she led Russia into full participation in European political and cultural life. With her ministers she reorganized the administration and law of the Russian Empire and extended Russian territory, adding the Crimea and much of Poland. Though she had once intended to emancipate the serfs, she instead strengthened the system she had once condemned as inhuman. She had great energy and wide interests, and her personal life was notable for her many lovers, including Grigory Potemkin.

Catherine de Medicis \ka-tren-d3-ma-de-'ses\ orig. Caterina de' Medici (b. April 13, 1519, Florence — d. Jan. 5, 1589, Blois, France) Queen consort of Henry II (1547-59), mother of Francis II, Charles IX, and Henry III, and regent of France (1560-74). A member of the Medici family, she married Henry in 1533 and bore him 10 children. She became queen when Henry inherited the crown in 1547, and she greatly mourned his accidental death in 1559. After their son Francis became king, she began a long struggle with members of the Guise family, extremists who sought to dominate the crown. After Francis's premature death in 1560, she became regent for Charles IX until 1563 and dominated the rest of his reign until 1574. She attempted to settle the Wars of Religion between Catholics and Huguenots. She has traditionally been blamed for the Massacre of Saint Bartholomew's Day, but, though she authorized the assassination of Gaspard II de Coligny and his principal followers, it appears that she did not authorize the massacre that followed.

Catherine Howard (b. c. 1520 — d. Feb. 13, 1542, London, Eng.) Fifth wife of Henry VIII of England. The granddaughter of the 2nd duke of Norfolk, she became a maid of honour to Anne of Cleves, Henry's fourth wife. After Henry had his marriage to Anne annulled, he married Catherine (1540). In 1541 he learned that Catherine had had several affairs before their marriage and that she also had probably committed adultery. Incensed, he had Parliament pass a bill in 1542 declaring it treason for an unchaste woman to marry the king. Catherine was beheaded two days later in the Tower of London.

Catherine of Alexandria, Saint (d. c. early 4th century, Alexandria, Egypt; feast day November 25) Early Christian martyr. According to tradition, she was a learned girl of noble birth who protested the per-

secution of Christians during the reign of the Roman emperor Maxentius. She converted the emperor's wife and defeated in debate the best scholars he sent to oppose her. She was sentenced to be killed with a spiked wheel (the Catherine wheel), but, when it broke, she was beheaded instead. Her body was transported by angels to the top of Mount Sinai. One of the most popular saints of the Middle Ages, she was patron of philosophers and scholars. Her historicity is doubtful.

Catherine of Aragon (b. Dec. 16, 1485, Alcala de Henares, Spain — d. Jan. 7, 1536, Kimbolton,

Huntingdon, Eng.) First wife of Henry VIII. The daughter of Ferdinand II and Isabella I, she married Henry in 1509. She gave birth to six children, but only one daughter (later Mary I) survived infancy. Henry's desire for a legitimate male heir prompted him in 1527 to appeal to Rome for an annulment, but Pope Clement VII refused, triggering the break between Henry and Rome and leading to the English Reformation. In 1533 Henry had his own archbishop of Canterbury, Thomas Cranmer, annul the marriage, and Catherine spent her last years isolated from public life.

Catherine of Braganza (b.

Nov. 25, 1638, Vila Vigosa, Port. — d.

Dec. 31, 1705, Lisbon) Portuguese wife of Charles II of England. She was married to Charles in 1662 as part of an alliance between England and Portugal, bringing England trading privileges and the port cities of Tangier and Bombay (now Mumbai). She produced no heir. Though not a faithful husband, Charles defended her against accusations of scheming

to poison him. She helped convert him to Catholicism shortly before his death. In 1692 she returned to Portugal, and in 1704 she governed the country as regent for her ailing brother, Pedro II.

Catherine of Siena, Saint orig. Caterina Benincasa (b. March 25, 1347, Siena, Tuscany — d. April 29, 1389, Rome; canonized 1461; feast day April 29) Dominican mystic and patron saint of Italy. She joined the Dominican third order in Siena in 1363 and soon became known for her holiness and severe asceticism. Catherine called for a Crusade against the Muslims as a means of calming domestic conflict in Italy. She also played a major role in returning the papacy from Avignon to Rome (see Avignon papacy). Her writings include four treatises on religious mysticism known as The Dialogue of St. Catherine.

Catherine Parr (b. 1512 — d. Sept. 7, 1548) Sixth and last wife of King Henry VIII of England. The daughter of an official in the royal household,

she had been widowed twice by the time she married Henry in 1543. She exerted a beneficial influence on the increasingly paranoid king and developed close friendships with his children by previous marriages. After Henry's death in 1547, she married Baron Thomas Seymour but died shortly after giving birth to a daughter.

catheterization V.ka-tho-ts-ro-'za-shonV Threading of a flexible tube (catheter) through a channel in the body to inject drugs or a contrast medium, measure and record flow and pressures, inspect structures, take samples, diagnose disorders, or clear blockages. A cardiac catheter, passed into the heart through an artery or vein (the incision is often in the groin), can also carry pacemaker electrodes. A bladder catheter goes through the urethra into the bladder.

cathode Terminal or electrode at which electrons enter a system, such as an electrolytic cell or an electron tube. In a battery or other source of direct current, the cathode is the positive terminal. In a passive load it is the negative terminal. In an electron tube, such as a cathode-ray tube, electrons stream off the cathode and travel through the tube toward the anode.

cathode ray Stream of electrons leaving the negative electrode, or cathode, in an evacuated or gas-filled discharge tube or emitted by a heated filament in certain electron tubes. Cathode rays cause fluorescent materials to luminesce and are utilized in cathode-ray oscilloscopes and television tubes (see cathode-ray tube).

cathode-ray tube (CRT) Vacuum tube that produces images when its phosphorescent surface is struck by electron beams. CRTs can be monochrome (using one electron gun) or colour (typically using three electron guns to produce red, green, and blue images that, when combined, render a multicolour image). They come in a variety of display modes, including CGA (Color Graphics Adapter), VGA (Video Graphics Array), XGA (Extended Graphics Array), and the high-definition SVGA (Super Video Graphics Array). See illustration on opposite page.

Catholic church. Old See Old Catholic church

Catholic Emancipation Freedom from discrimination and civil disabilities granted to the Roman Catholics of Britain and Ireland in the late 18th and early 19th century. After the Reformation, Roman Catholics in Britain could not purchase land, hold offices or seats in Parliament, inherit property, or practice their religion without incurring civil penalties. Irish Catholics faced similar limitations. By the late 18th century, Catholicism no longer seemed so great a social and political danger, and a series of laws, culminating in the Emancipation Act of 1829, eased the restrictions. A major figure in the struggle for full emancipation was Daniel O'Connell.

Catholic League (1609-35) Military alliance of the Catholic powers of Germany, led by Maximilian I, duke of Bavaria, and designed to stem the growth of Protestantism in Germany. Plans for a league had long been discussed, but the formation of the Protestant Union in 1608 finally caused the Catholics to unite. In alliance with the Habsburg emperors, the League's forces, led by Graf von Tilly, played a key role in the Thirty Years' War. The league was abolished by the Peace of Prague (1635).

Catholic Reformation See Counter- Reformation

Catiline Vkat- : T- l In\ orig. Lucius Sergius Catilina (b. c. 108 — d. 62

bc, Pistoria, Etruria [Italy]) Roman aristocrat turned demagogue who sought to overthrow the republic. He was first suspected of conspiracy in 65, after which he sought to be elected consul. Failing twice, he planned a coup, known as Catiline's conspiracy (63), assembling an army outside Rome from his supporters among the alienated and discontented elements

Catherine of Aragon.

ANN RONAN PICTURE UBRARY/HERITAGE-IMAGES

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of society. Cicero, then consul, learned of the conspiracy; with Senate approval, he caught and executed a group of the plotters in Rome, and later sent the army to defeat and kill Catiline in northern Italy (62).

cation Vkat-,I-3n\ Atom or group of atoms carrying a positive electric charge, indicated by a superscript plus sign after the chemical symbol. Cations in a liquid subjected to an electric field collect at the negative pole (cathode). Examples include sodium (Na +), calcium (Ca 2+), and ammonium (NH 4 + ; see ammonia). See also ion; compare anion.

catkin Elongated cluster of single-sex flowers bearing scaly bracts and usually lacking petals. Many trees bear catkins, including willows, birches, and oaks. Wind carries pollen from male to female catkins or from male catkins to female flowers that take a different form (e.g., in spikes).

Catlett, Elizabeth (b. April 15, 1919, Washington, D.C., U.S.) Expatriate U.S. sculptor and printmaker. Catlett was bom into a middle-class family. After studying sculpture, she went to Mexico City in 1946 to work at the Taller de Grafica Popular, an artists' collective, where she created prints depicting Mexican life. About 1962 she took Mexican citizenship. In her sculptures and prints, Catlett focused on mother-child pairings, famous subjects such as Harriet Tubman and Malcolm X, and anonymous workers — notably strong, solitary black women.

Catlin, George (b. July 26, 1796, Wilkes-Barre, Pa., U.S. — d. Dec. 23, 1872, Jersey City, N.J.) U.S. painter and author. He practiced law briefly before becoming a self-taught portrait painter in Philadelphia (1823). Long interested in Native American life, in 1830 he began a series of visits to various tribes on the Great Plains. He produced some 500 paintings and sketches based on his travels and exhibited them in the U.S.

heater

accelerating anodes

graphite coating

electron beam

| electron-emitting insulator glass neck /
'cathode of tube /

red, green, and blue
electron guns

red

beam

green

beam

blue
beam

aperture

grille

"glass tube face
^phosphor coating on back of glass

In a colour-television tube, three electron guns (one each for red, green, and blue) fire electrons toward the phosphor-coated screen. The electrons are directed to a specific spot (pixel) on the screen by magnetic fields, induced by the deflection coils. To prevent "spillage" to adjacent pixels, a grille or shadow mask is used. When the electrons strike the phosphor screen, the pixel glows. Every pixel is scanned about 30 times per second.

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and Europe. In 1854-57 he traveled to Central and South America; in 1858-70 he lived in Europe. He published several illustrated books on Native American life. Most of his collection was acquired by the Smithsonian Institution for its ethnographic and historical interest.

catnip or catmint Aromatic herb (. Nepeta cataria) of the mint family. Catnip has spikes of small, purple-
dotted flowers. It has been used as a

seasoning and as a medicinal tea for colds and fever. Because its mintlike flavour and aroma are particularly exciting to domestic cats, it is often used as a stuffing for cat toys.

Cato \'ka-to\, Marcus Porcius known as Cato the Censor or Cato the Elder (b. 234, Tusculum, Latium — d. 149 bc) Roman statesman and orator, the first important Latin prose writer. Born of plebeian stock, he fought in the Second Punic War. His oratorical skills paved the way for his political career. He held conservative anti-Hellenic views and opposed the pro-Hellenic Scipio family, whose power he broke. Elected censor (magistrate in charge of censuses, taxes, and the public good) in 184, he tried to restore the mos majorum (“ancestral custom”) and combat Greek influence, which he believed undermined Roman morality. He crafted laws against luxury and the financial freedom of women and never ceased to demand the destruction of Carthage. His writings include works on history, medicine, law, military science, and agriculture. His great-grandson Cato the Younger (b. 95 — d. 46 bc) was a leading Optimate (see Optimates and Populares) who sought to preserve the republic against Julius Caesar.

Catnip (Nepeta cataria).

WALTER CHANDOHA

Cats \'kats\, Jacob(us) known as Father Cats (b. Nov. 10, 1577, Brouwershaven, Zeeland, Spanish Netherlands — d. Sept. 12, 1660, Zorgvliet, near The Hague) Dutch poet. A magistrate and high official, he was enormously popular as a writer of emblem books, consisting of woodcuts or engravings with verses possessing a moral. His Mirror of Old and New Times (1632) contains many quotations that have become household sayings in the Netherlands, and he used it to express the ethical concerns of Dutch Calvinists, especially about love and marriage.

cat's-eye Any of several gemstones that display a luminous band reminiscent of the eye of a cat. Grayish green or greenish quartz cat’s-eye is the most common type; although it comes from the Orient, it is often called occidental cat’s-eye to differentiate it from the rarer, and more valuable, precious or oriental cat’s-eye, which is a greenish variety of chrysoberyl. Crocidolite cat’s-eye (African cat’s-eye) is more commonly known as tigereye. Corundum

cat’s-eye is an imperfect star sapphire or ruby in which the star is reduced to a luminous zone.

Catskill Mountains Mountain group of the Appalachian mountain system, southeastern New York, U.S.

It is bounded by the Mohawk and Hudson rivers. Many of its peaks reach 3,000 ft (900 m); the highest. Slide Mountain, reaches 4,204 ft (1,281 m). The area has many resorts, and its lakes supply New York City with water. The mountains were made famous through Washington Irving’s stories of Rip Van Winkle, who supposedly took his long nap near the town of Catskill.

Chrysoberyl cat's-eye with yellow banding on a brown stone

JOHN H. GERARD

Catt, Carrie Chapman orig. Carrie Lane (b. Jan. 9, 1859, Ripon, Wis., U.S. — d. March 9, 1947, New Rochelle, N.Y.) U.S. advocate of woman suffrage. A graduate of Iowa State College (1880), she became a high-school principal in Mason City, Iowa, in 1881 and superintendent of schools two years later; she was one of the first U.S. women to hold such a post. She married Leo Chapman in 1884. After his untimely death in

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1886 she devoted herself to organizing the Iowa Woman Suffrage Association (1887-90). Her marriage to George W. Catt, an engineer, in 1890, was unusual in its prenuptial legal contract providing her with four months of free time each year to work exclusively for woman suffrage. In 1900 she was elected to succeed Susan B. Anthony as president of the National American Woman Suffrage Association (NAWSA).

Between 1905 and 1915 Catt reorganized the NAWSA along political district lines. By then an accomplished public speaker, she served as the group's president from 1915 until her death. After ratification of the Nineteenth Amendment, which granted voting rights to women, she reorganized the NAWSA as the League of Women Voters to work for progressive legislation, including the cause of world peace. See also woman suffrage movement.

cattail Any of the tall reedy marsh plants (see reed) that bear brown, furry fruiting spikes and make up the genus Typha (family Typhaceae), particularly T. latifolici, the long flat leaves of which are used especially for making mats and chair seats. Cattails are found mainly in temperate and cold regions of the Northern and Southern hemispheres. Important to wildlife, they are also often cultivated ornamentally as pond plants and for dried-flower arrangements. The leaves, which swell when wet, are used for caulking cracks in barrels and boats.

Cattell \k3-'tel\, James McKeen (b. May 25, 1860, Easton, Pa., U.S. — d. Jan. 20, 1944, Lancaster, Pa.) U.S. psychologist. He studied with Wilhelm Wundt in Leipzig and later assisted Francis Galton in London. Teaching at the University of Pennsylvania (1888-91) and Columbia University (1891-1917), where Edward L. Thorndike was his student, he oriented U.S. psychology toward use of objective experimental methods, mental testing, and applied psychology. Much of his career was devoted to editing and publishing scientific periodicals; he was a founder of Psychological Review (1894), edited Science for 50 years (from 1894), and founded the directory American Men of Science (1906).

cattle Domesticated bovids that are raised for meat, milk, or hides or for draft purposes. Depending on the breed, mature bulls (fertile males) weigh 1,000-4,000 lbs (450-1,800 kg); cows (fertile females) weigh 800-2,400 lbs (360-1,080 kg). All modern cattle are believed to belong to either of two species (Bos indicus or B. taurus) or to be crosses of the two. About 277 identifiable breeds include those prominent in beef production (e.g., Angus, Hereford, and shorthorn) and dairy farming. Cattle feed primarily by grazing on pasture, but in modem farming their diet is ordinarily supplemented with prepared animal feeds. See also aurochs, Brahman, ox.

Cattle Raid of Cooley, The Vtan y - l bo- , ku-3l y -n y 9, 'tany-'bo-'ku-PeV Irish Tain Bo Cuailgne Irish narrative, the longest of the Ulster cycle. It was composed in prose with verse passages in the 7th-8th century, probably by an author acquainted with such epics as the Aeneid. Its hero is Cu Chulainn, who singlehandedly held off the Connaught army that invaded Ulster to capture a famous and valuable brown bull. After three days of battle, Cu Chulainn gained victory, yet the Connaughts successfully captured the bull. Madb, the warrior-queen of Connaught, secured her superiority over her husband Ailill when the brown bull defeated Ailill' s white-horned bull.

Catullus \k3-'t9l-9s\, Gaius Valerius (b. c. 84, Verona, Cisalpine Gaul — d. c. 54 bc, Rome) Roman poet. Few facts about his life are certain. Of 116 extant poems, 25 portray an intense and unhappy affair with a married woman ("Lesbia"); others reflect an affair with the youth Juventius; still others are outbursts of contempt for Julius Caesar and other per-

sonages. He displayed remarkable versatility in assorted poetic forms, and his conversational rhythms carry an immediacy unrivaled by any other classical poet. His expressions of love and hatred represent perhaps the finest lyric poetry of ancient Rome.

Cauca \'kau-ka\ River River, western Colombia. It rises in the Andes Mountains and flows northward, between the Cordillera Occidental and

the Cordillera Oriental, 838 mi (1,348 km) to join the Magdalena River north of Mompos. In its middle reaches, its valley is important for agriculture and cattle raising. Two-thirds of Colombia’s coffee is produced in the adjacent uplands.

Caucasian \k6-'ka-zhon\ languages Group of languages spoken in the Caucasus region that are not members of any language families spoken elsewhere in the world. Caucasian languages, spoken by some nine million people, are divided into three subgroups: the South Caucasian, or Kartvelian family; the Northwest Caucasian, or Abkhaz- Adyghe languages; and the Northeast Caucasian, or Nakh-Dagestanian languages. Kartvelian, with more than 4.5 million speakers, comprises four relatively closely related languages, including Georgian. Northwest Caucasian languages include Abkhaz and a chain of dialects called collectively Circassian. The Northeast Caucasian languages are further divided into two groups, Nakh and Dagestanian. The Nakh languages include Chechen and Ingush, spoken by more than a million people mainly in Chechnya and Ingushetia. Dagestanian is an extraordinarily diversified group of 25-30 languages spoken by some 1.7 million people mainly in northern Azerbaijan and the Republic of Dagestan. Several Dagestanian languages, including Avar, Lak, Dargva, and Lezgi, number their speakers in the hundreds of thousands; others are spoken in only a few villages. In spite of their great diversity, most Caucasian languages have in common large consonant inventories; in some languages the number of consonants distinguished approaches 80. Those Caucasian languages with standard written forms employ the Cyrillic alphabet, with the prominent exception of Georgian. An effort is being made to introduce the Latin alphabet for Chechen in Chechnya.

Caucasoid See race

Caucasus Vko-ko-sosV or Caucasia \k6-'ka-zho\ Mountainous region, between the Black and Caspian seas. Occupying roughly 170,000 sq mi (440,000 sq km), it is divided among Russia, Georgia, Azerbaijan, and Armenia and forms part of the traditional dividing line between Europe and Asia. It is bisected by the Caucasus Mountains; the area north of the Greater Caucasus range is called Ciscaucasia and the region to the south Transcaucasia. Inhabited from ancient times, it was under nominal Persian and Turkish suzerainty until conquered by Russia in the 18th- 19th centuries.

Caucasus Vko-ko-sosN Mountains Russian Kavkazsky Khrebet

\k9f-'ka-ske-kryi-'byet\ Mountain range between the Black and Caspian seas. It is sometimes considered the southeastern limit of Europe. Of volcanic origin, it forms two distinct chains — the Greater Caucasus in the north and the Lesser Caucasus in the south — that extend about 750 mi (1,200 km) across southern Russia, Georgia, Azerbaijan, and Armenia. Many peaks rise above 15,000 ft (4,600 m); the highest is Mount Elbrus.

The range is crossed by several high passes, including the Daryal and Mamison. It possesses considerable waterpower resources, including those in the Kura-Aras Lowland, and valuable petroleum and natural gas reserves. Caucasus Nature Reserve and other areas in the western part of the range were designated a UNESCO World Heritage site in 1999.

Cauchy \ko-'she\, Augustin-Louis, Baron (b. Aug. 21, 1789, Paris, France— d. May 23, 1857, Sceaux) French mathematician, pioneer of analysis and group theory. After a career as a military engineer in Napoleon's navy, he wrote a treatise in 1813 that became the basis of the theory of complex variables. He also clarified the theory of calculus by developing the concepts of limits and continuity, laid the foundations for the mathematical theory of elasticity, and made important contributions to number theory. He is considered one of the greatest mathematicians of the modern era.

Cauchy-Schwarz \'shworts\ inequality Any of several related inequalities developed by Augustin-Louis Cauchy and, later, Herman Schwarz (1843-1921). The inequalities arise from assigning a real number measurement, or norm, to the functions, vectors, or integrals within a particular space in order to analyze their relationship. For functions / and g, whose squares are integrable and thus usable as a norm, (. Ifg f ^ df)(!g 2)- For vectors a = (a : , a 2 , a 3 ,..., a„) and b = (b x , b 2 , b n), together with the inner product (see inner product space) for a norm, (Z(aj, bf) 2 < T(a i) 2 'L(b i) 2 . In addition to functional analysis, these inequalities have important applications in statistics and probability theory.

caudillo \kau-'de-y6\ Latin American military dictator. In the wake of the Latin American independence movement in the early 19th century.

Carrie Chapman Catt.

COURTESY OF THE LEAGUE OF WOMEN VOTERS OF ILLINOIS

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politically unstable conditions and the long experience of armed conflict led to the emergence in many of the new countries of strongmen who were often charismatic and whose hold on power depended on control over armed followers, patronage, and vigilance. Because their power was based on violence and personal relations, the legitimacy of the caudillos' rule was always in doubt, and few could withstand the challenges of new leaders who emerged among their own followers and wealthy patrons. See also machismo; personalismo.

Caulaincourt \ I ko- I la ll - , kur\, Armand (-Augustin-Louis), marquis de (b. Dec. 9, 1773, Caulaincourt, France — d. Feb. 19, 1827, Paris)

French general and diplomat. He became aide-de-camp to Napoleon (1802) and was the emperor's loyal master of horse from 1804. He later served as ambassador to Russia (1807-11) and foreign minister (181 3—14, 1815). Created duke de Vicence (1808), he was at Napoleon's side in his great battles. His Memoires provide an important source for the period 1812 to 1814.

cauliflower Form of cabbage (Brassica oleracea, Botrytis group) in the mustard family, consisting of a compact terminal mass of greatly thickened, modified, and partially developed flower structures, together with their embracing fleshy stalks.

This terminal cluster forms a firm, white, succulent "curd" that is served as a cooked vegetable and is highly nutritious. The separated flower structures are also eaten raw.

Caulkins, Tracy (b. Jan. 11, 1963,

Winona, Minn., U.S.) U.S. swimmer.

In 1978 she became (at age 15) the first woman to swim the 200-yd medley in under two minutes. By 1982 she had surpassed Johnny Weissmuller's record of 36 U.S. national titles and had won more titles than any other U.S. amateur athlete. After the 1984 Olympics, where she won three gold medals, she retired having won 48 national titles and having set 66 world or U.S. records. Caulkins is the only swimmer to set U.S. records in every stroke.

causation Relation that holds between two temporally simultaneous or successive events when the first event (the cause) brings about the other (the effect). According to David Hume, when we say of two types of object or event that "X causes Y" (e.g., fire causes smoke), we mean that (i) Xs are "constantly conjoined" with Ys, (ii) Ys follow Xs and not vice versa, and (iii) there is a "necessary connection" between Xs and Ys such that whenever an X occurs, a Y must follow. Unlike the ideas of contiguity and succession, however, the idea of necessary connection is subjective, in the sense that it derives from the act of contemplating objects or events that we have experienced as being constantly conjoined and succeeding one another in a certain order, rather than from any observable properties in the objects or events themselves. This idea is the basis of the classic problem of induction, which Hume formulated. Hume's definition of causation is an example of a "regularity" analysis. Other types of analysis include counterfactual analysis, manipulation analysis, and probabilistic analysis.

caustic soda Sodium hydroxide (NaOH), an inorganic compound. The alkalies called caustic soda and caustic potash (potassium hydroxide) are very important industrial chemicals, with uses in the manufacture of soaps, glass, and numerous other products. They have been easily extracted since ancient times by soaking wood ashes in water (see lye). Industrial methods of caustic-soda production developed in the 1 8th century (the Leblanc process) and 19th century (the Solvay, or ammonia-soda,

process) have been largely displaced by electrolysis.

Cauvery River See Kaveri River

Cavafy \k9-'vaf-e\, Constantine orig. Konstantinos Petrou K a vans (b. April 17, 1863, Alexandria — d. April 29, 1933, Alexandria) Poet of Turkish-Greek ancestry. Born to Greek parents, Cavafy worked as an obscure civil servant in Alexandria his entire adult life. His small body of work, some 200 poems in an intimate, realistic, lyrical style, is written in a strange combination of classically based and modern Greek. Many deal with history, principally the Hellenistic era; many others reflect

Cavafy's homosexual life. His poems became popular and influential after his death, and he is now widely regarded as one of the greatest of modern Greek poets.

Cavaignac \ka-ven-'yak\/ Louis-Eugene (b. Oct. 15, 1802, Paris,

France — d. Oct. 28, 1857, Sarthe)

French general. He served with distinction in the French conquest of Algeria in the 1840s. In the Revolutions of 1 848 he was appointed minister of war. In June he suppressed a workers' revolt, becoming known as "the butcher of June" (see June Days). That month he was named chief executive of France. In December he lost the presidential election to Louis-Napoleon Bonaparte (later Napoleon III) but remained a leader of the opposition.

Cavaille-Coll \k3-vI-ya-'kol\, Aristide (b. Feb. 4, 1811, Montpellier, France — d. Oct. 13, 1899, Paris) French organ builder. He settled in Paris in 1833 at Gioacchino Rossini's suggestion and with his brother and father built almost 500 organs in France, Belgium, The Netherlands, and elsewhere, including those in the Paris churches of Notre-Dame, La Madeleine, Ste. Clotilde, and La Trinite. With the goal of achieving an orchestral richness and variety of timbre, he introduced countless innovations; he is regarded as the creator of the French Romantic organ (which had great influence elsewhere as well), and composers such as Cesar Franck, Camille Saint- Saens, and Olivier Messiaen wrote particularly with the Cavaille-Coll sound in mind.

Cavalcanti \,ka-val-'kan-te\, Guido (b. c. 1255, Florence — d. Aug. 27/28, 1300, Florence) Italian poet. Born into an influential Florentine family, he studied with the philosopher and scholar Brunetto Latini, who had earlier taught Dante, Cavalcanti's close friend. After Dante, he is considered the greatest Italian poet and personality in 13th-century Italian literature. He left about 50 poems, many addressed to two women and on the theme of love. His language demonstrates the grace and directness of the dolce stil nuovo ("sweet new style"). Dante Gabriel Rossetti and Ezra Pound translated his poems.

Cavalier \,kav-3-'lir\ In the English Civil Wars, the name adopted by Charles I’s supporters, who contemptuously called their opponents Roundheads (a reference to the short-haired apprentices who had formed part of an anti-Cavalier mob). The term (similar to the French chevalier) originally meant a rider or cavalryman. At the Restoration, the court party preserved the name Cavalier, which survived until the rise of the term Tory. See also Cavalier poet.

Cavalier \,kav-3-'lir\ poets Group of English gentlemen poets who were Cavaliers (supporters of Charles I during the English Civil Wars). The term embraces Sir John Suckling, Edmund Waller, Robert Herrick, Thomas Carew (15947-16407), and Richard Lovelace (1618-57). Accomplished as soldiers, courtiers, gallants, and wits, they wrote polished and elegant lyrics, typically on love and dalliance and sometimes on war, honour, and duty to the king.

Cavalli \ka-'val-le\, (Pier) Francesco orig. Pietro Francesco Caletti-Bruni (b. Feb. 14, 1602, Crema, Republic of Venice — d. Jan. 14, 1676, Venice) Italian opera composer. In his teens he was a singer under Claudio Monteverdi at St. Mark's Basilica, Venice. Also an organist, he would rise to the post of maestro di cappella there in 1668. He wrote some 30 operas for Venice’s public opera houses. The most popular opera composer of the decades following Monteverdi’s death, he was the latter’s leading successor, his chief rival for that status being Antonio Cesti (1623-69). His most celebrated operas were Egisto (1643), Giasone (1649), Xerse (1654), and Erismena (1655).

Cavallini V.ka-val-'le-neV Pietro (b. c. 1250, Rome — d. c. 1330) Italian painter and mosaicist active mainly in Rome. His major surviving works are mosaics depicting scenes from the life of the Virgin for the Roman church of Santa Maria in Trastevere (1290s) and fragments of a fresco cycle, including a Last Judgment, for the church of Santa Cecilia in Trastevere (c. 1293). He was the first to break with the stylizations of

Cauliflower (Brassica oleracea, Botrytis group).

DEREK FELL

Constantine Cavafy.

DIMITRI PAPADIMOS

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Byzantine art; his figures have a sense of weight and three-dimensionality. Cavallini had many students, and his work was an important influence on his great contemporary Giotto.

cavalry \'ka-V3l-re\ Military force mounted on horseback, formerly an important element in the armies of all major powers. When used in combination with other military forces, its main duties included gathering information about the enemy, screening movements of its own army, pursuing a defeated enemy, striking suddenly at detected weak points, turning exposed flanks, and exploiting a penetration or breakthrough. In the late 19th century, largely because of the introduction of repeating rifles and machine guns, cavalry lost much of its former value. By World War I, a cavalry charge against a line of entrenched troops with rapid-firing small arms was suicidal. Armoured vehicles soon replaced horses, and by the 1950s no modern army had horse-mounted units. Today’s units designated “cavalry” employ helicopters and light armoured vehicles in ways analogous to horse cavalry.

cave Naturally formed underground cavity. A cave often consists of a number of underground chambers, constituting a series of caverns. An assemblage of such caverns interconnected by smaller passageways makes up a cave system. Primary caves, such as lava tubes and coral caves, develop during the time when the host matrix is solidifying or being deposited. Secondary caves, such as marine grottoes, originate after the host matrix has been deposited or consolidated. Most caves are of the latter type, including solution caves formed by the chemical dissolution of a soluble host rock that has been weakened by fracturing and mechanical erosion; Mammoth Cave and Carlsbad Caverns are examples of solution caves.

Cavell Yka-volV Edith (Louisa) (b. Dec. 4, 1865, Swardeston, Norfolk, Eng. — d. Oct. 12, 1915, Brussels, Belg.) English nurse and heroine of World War I. She began her nursing career in 1895 and in 1907 became first matron of a hospital in Brussels, where she greatly improved the standard of nursing.

After the German occupation of Belgium (1914), she became involved in an underground group that helped about 200 Allied soldiers escape to The Netherlands. She was subsequently arrested and executed by the Germans.

Cavendish \'kav-on-dish\, Henry (b. Oct. 10, 1731, Nice, France — d.

Feb. 24, 1810, London, Eng.)

English physicist and chemist. A millionaire by inheritance, he lived as a recluse most of his life. He discovered the nature and properties of hydrogen, the specific heat of certain substances, and various properties of electricity. He measured the density and mass of the Earth by the method now known as the Cavendish experi-

ment. He discovered the composition of air, work that led to the discovery that water is a compound rather than an element and to the discovery of nitric acid. He anticipated Ohm’s law and independently discovered Coulomb’s law of electrostatic attraction. He left his fortune to relatives who later endowed the Cavendish Laboratory at the University of Cambridge (1871).

Cavendish \'kav-9n-,dish\ experiment Measurement of the force of gravitational attraction between pairs of lead spheres, which allowed the first calculation of the value of the universal gravitational constant, G. Performed in 1797-98 by the British scientist Henry Cavendish (173 1—1810) using a torsion balance, the experiment was popularly known as “weighing Earth,” because determination of G permitted calculation of Earth’s mass.

caviar Eggs, or roe, of sturgeon preserved with salt. Most true caviar is produced in Russia and Iran, from fish taken from the Caspian and Black seas. The best grade, beluga, is prepared from large black or gray eggs; fresh beluga is relatively scarce and thus expensive. Caviar may be pasteurized for longer storage. Lesser grades are made from smaller, denser eggs. In the U.S., the roe of salmon, whitefish, lumpfish, and paddlefish is sometimes sold under the name caviar.

cavitation Formation of vapour bubbles within a liquid at low-pressure regions that occur in places where the liquid has been accelerated to high velocities, as in the operation of centrifugal pumps, water turbines, and marine propellers. Cavitation is undesirable because it produces extensive erosion of the rotating blades, additional noise from the resultant knocking and vibrations, and a significant reduction of efficiency because it distorts the flow pattern. The cavities form when the pressure of the liquid has been reduced to its vapour pressure; they expand as the pressure is further reduced along with the flow, and they suddenly collapse when they reach regions of higher pressure.

cavity wall In architecture, a double wall consisting of two wythes (vertical layers) of masonry separated by an air space and joined together by metal ties. The cavity allows moisture that penetrates the exterior wythe to drain. Cavity walling is used as both non-load-bearing infill for framed buildings and for bearing-wall construction.

Cavour \k3-'vur\, Camillo Benso, count di (b. Aug. 10, 1810, Turin, Piedmont, French Empire — d. June 6, 1861, Turin, Italy) Italian statesman, leading figure of the Risorgimento. Influenced by revolutionary ideas from an early age, he traveled to Paris and London and in 1847 founded the liberal newspaper II Risorgimento, and he helped persuade Charles Albert to grant a liberal constitution. Elected to Parliament in 1848, Cavour held several cabinet posts before becoming prime minister of Piedmont (1852-59, 1860-61). His exploitation of international rivalries and of revolutionary movements brought about the unification of Italy under the house of Savoy, with himself as the first prime minister of the new kingdom (1861).

cavy \'ka-ve\ Any of several specie
tuting the family Caviidae. Species
in the genera Cavia, Kerodon, Galea,
and Microcavia resemble the guinea
PIG. They are stout, gray or brown,

and 10-12 in. (25-30 cm) long, with short ears and legs and no visible tail.

The Patagonian and salt desert cavies (Dolichotis) are more long-legged and rabbitlike. Cavies are social animals found in various habitats, including plains, marshes, and rocky areas. They live in burrows (which sometimes weaken the ground above so much that it collapses when walked on), and they feed on grass, leaves, and other vegetation.

Cawnpore See Kanpur

Caxton, William (b. c. 1422, Kent, Eng. — d. 1491, London) First British printer. He was a prosperous mercer when he began to translate French literature and learn printing. He set up a press in Belgium and published his translation The Recuyell of the Historyes ofTroye (1475), the first book printed in English. Returning to England, he set up another press and produced the first dated book printed in English, Dictes and Sayenges of the Phylosophers (1477). His varied output — about 100 items, including books on chivalric romance, morality, and history and an encyclopaedia that was the first illustrated English book (1481) — shows that he catered to a general public as well as to wealthy patrons.

Cayce \'ka-se\, Edgar (b. March 18, 1877, near Hopkinsville, Ky., U.S. — d. Jan. 3, 1945, Virginia Beach, Va.) U.S. faith healer. He received little formal education. He began his cures in the 1920s, often accomplishing them long-distance. In 1925 he settled in Virginia Beach, Va., where he established a hospital (1928) and the Association for Research and Enlightenment (1931). He also made prophecies (including of the destruction of New York City and California) and claimed to be able to recall past lives. He believed in the existence of a great civilization in Atlantis some 12,000 years ago.

Cayenne \kl-'en\ Seaport (pop., 1999: 50,594), capital of French Guiana. The city was founded by the French in 1643 on northwestern Cayenne Island, which is formed by the estuaries of the Cayenne and Mahury rivers. In the mid- 19th century it became a centre of French penal settlements in Guiana and was known as the “city of the condemned” (see Devils Island). The prisons were closed in 1945.

Edith Cavell

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of South American rodents consti-

Patagonian cavy, or mara (Dolichotis patagona).

GEORGE HOLTON-PHOTO RESEARCHERS

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Cayley, Sir George (b. Dec. 27, 1773, Scarborough, Yorkshire, Eng. — d. Dec. 15, 1857, Brompton, Yorkshire) British pioneer of aerial navigation and founder of the science of aerodynamics. By 1799 he had established the basic configuration of the modern airplane. He built his first model glider in 1804, and in 1809 he published his groundbreaking aerodynamic research. Further research into the effects of streamlining, stability, and wing design led to his construction of the first full-size glider, which flew briefly in 1853. Cayley also invented the caterpillar tractor (1825) and founded a polytechnic school in London (1839).

Cayman Islands British overseas territory (pop., 2005 est.: 47,000), Caribbean Sea. Located about 180 mi (290 km) northwest of Jamaica, it has a total land area of 118 sq mi (306 sq km). The islands include Grand Cayman (the largest and the location of the capital, George Town), Little Cayman, and Cayman Brae. Though discovered by Christopher Columbus in 1503, the islands were never occupied by the Spanish. Ceded to the British in 1670, they were subsequently settled by the English arriving from Jamaica. The islands were administered as a dependency of Jamaica until Jamaican independence in 1962; a constitution was enacted in 1972. The governor of the Cayman Islands is appointed by the British crown. The islands are a popular tourist area and a financial centre.

CBS Television Network Major U.S. broadcasting company and network. It began in 1928 as the Columbia Broadcasting System, a small radio network directed by William S. Paley. By offering programming free to affiliated stations in return for their agreement to broadcast sponsored shows, Paley built the network from 22 stations to 114 in 10 years. Such stars as Fred Allen, Bing Crosby, and Kate Smith increased audience ratings into the 1940s. Jack Benny, Ed Sullivan, Lucille Ball, Mary Tyler Moore, and Walter Cronkite made CBS the dominant television network into the 1970s. The company diversified into several other fields, but only Columbia Records was successful, and the corporation sold all its other divisions in 1985 to concentrate on broadcasting. A decline in ratings and in the number of affiliated stations led to its sale to Westinghouse Electric Corp. in 1995. CBS Corp. was purchased by Viacom Inc. in 2000.

ccc See Civilian Conservation Corps

CCD in full charge-coupled device Semiconductor device in which the individual semiconductor components are connected so that the electrical charge at the output of one device provides the input to the next device. Because they can store electrical charges, CCDs can be used as memory devices, but they are slower than RAMs. CCDs are sensitive to light, and are therefore used as the light-detecting components in video and digital cameras and in optical scanners.

CD See certificate of deposit
CD See compact disc

CD-ROM in full compact disc read-only memory Type of computer storage medium that is read optically (e.g., by a laser). A CD-ROM drive uses a low-power laser beam to read digitized (binary) data that have been encoded onto an optical disc in the form of tiny pits, then feeds the data to a computer for processing. Because it uses digital data, a CD-ROM can store images and sound in addition to text and is thus used in video and audio devices to store music, graphics, and movies (see compact disc). Unlike conventional magnetic-storage technologies (e.g., hard disks), CD-ROM drives cannot write information (that is, accept the input of new data), hence the tag “read-only.” Recordable compact discs (called CD-R) must be written on a CD-R recorder and can be played on any CD-ROM drive.

CDC See Centers for Disease Control and Prevention

Ceausescu\chau-'shes-kii\,Nico-

lae (b. Jan. 26, 1918, Scornice§ti,

Rom. — d. Dec. 25, 1989, near Bucharest) Romanian politician.

Prominent in the Romanian Communist Party, in 1965 he succeeded Gheorghe Gheorghiu-Dej as the party’s leader. In 1967 he became head of state and in 1974 president of Romania. He charted an independent, nationalistic course but also maintained rigidly repressive controls over free speech and internal dissent. His harsh economic policies and grand building projects reduced Romania from relative prosperity to near starvation. He was overthrown in a revolution in 1989, and, after a hasty trial, he and his wife were executed by firing squad.

Cebu \sa-'bu\ Island (pop., 2000 : 2,377,588) and (with adjacent islets) province, central Philippines. It is 139 mi (224 km) long and about 20 mi (32 km) wide, with an area of 1,707 sq mi (4,421 sq km). Its chief city is Cebu City. A mountain chain extends its entire length. It is separated from Bohol Island by Bohol Strait and from Negros Island by Tanon Strait. Visited by Ferdinand Magellan in 1521, it was occupied by the Spanish in 1565. It is one of the Philippines’ most densely populated islands; it produces coal and copper.

Cebu City City (pop., 2000: 718,821), capital of Cebu province, Philippines. Located on the eastern coast of Cebu Island, it is the oldest Spanish city in the Philippines. It possesses an excellent harbour, sheltered by Mactan Island. Attracted by Cebu’s focal position, Ferdinand Magellan landed there in 1521 and converted the ruler to Christianity; in a later war

expedition on the ruler's behalf, Magellan was killed on Mactan Island. Occupied by Miguel Lopez de Legazpi in 1565, it was until 1571 the capital of Spanish possessions in the Philippines. It remained the primary Spanish bastion in the south and had prominent roles in insurrections against both Spain and the U.S. Having recovered from heavy damage sustained in World War II, Cebu City is now a cultural and commercial centre.

Cech Vchek\, Thomas (Robert) (b. Dec. 8, 1947, Chicago, 111., U.S.) U.S. biochemist, molecular biologist, and Nobel laureate. He received his Ph.D. from UC-Berkeley in 1975. In 1982 he became the first to show that an RNA molecule could catalyze a chemical reaction. He and Sidney Altman were awarded a 1989 Nobel Prize for their independent discoveries that RNA, previously thought to be only a messenger of genetic information, can also catalyze cellular chemical reactions essential to life.

Cecil Vse-solV Robert, 1st earl of Salisbury (b. June 1, 1563, London, Eng. — d. May 24, 1612, Marlborough, Wiltshire) English statesman. Trained in statesmanship by his father, William Cecil, Robert entered the House of Commons in 1584. He became acting secretary of state in 1590 and was formally appointed to the post by Elizabeth I in 1596. He succeeded his father as chief minister in 1598 and guided the peaceful succession of Elizabeth by James I, for whom he continued as chief minister from 1603 and lord treasurer from 1608. He negotiated the end of the war with Spain in 1604 and allied England with France.

Cecil (of Chelwood), (Edgar Algernon) Robert Gascoyne-Cecil, 1st Viscount (b. Sept. 14, 1864, London, Eng. — d. Nov. 24, 1958, Tunbridge Wells, Kent) British statesman. The son of the marquess of Salisbury, he served during World War I as minister of blockade and as assistant secretary of state for foreign affairs. He was one of the principal draftsmen of the League of Nations covenant in 1919 and, as president of the League of Nations Union (1923^15), one of the League's most loyal workers until it was superseded by the United Nations. In 1937 he was awarded the Nobel Peace Prize.

Cecil, William, 1st Baron Burghley \'bor-le\ (b. Sept. 13, 1520, Bourne, Lincolnshire, Eng. — d. Aug. 5, 1598, London) English statesman, principal adviser to Elizabeth I through most of her reign and a master of Renaissance statecraft. Having served as a councillor and cosecretary to Edward VI, he was appointed Elizabeth's sole secretary when she became queen in 1558. A dedicated and skillful adviser to the queen, Cecil was created Baron Burghley in 1571 and appointed lord high treasurer (1572—98). He obtained the trial and execution of Mary, Queen of Scots, thus securing the Protestant succession, and his preparations enabled England to survive the Spanish Armada. But he failed to induce Elizabeth to marry or to reform her church along more Protestant lines.

Cecilia, Saint (fl. 3rd century, Rome; feast day November 22) Early Christian martyr and patron saint of music. According to a late 5th-century tradition, she was a noble Roman who had dedicated her virginity to God as a child and was married against her will to Valerian, a noble pagan. She told him of her vow, and he promised he would let her keep it if he could see the angel with whom she conversed. After being baptized, Valerian saw Cecilia talking to the angel. Valerian's brother also converted, and both were eventually martyred. Cecilia's good works infuriated the

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Roman prefect, who ordered her burned at the stake; when the flames did not harm her, she was beheaded. Her relics were discovered in the 9th century by Pope Paschal I, who moved them to the church in Rome that bears her name.

cedar Any of four species of tall ornamental and timber evergreen coniferous trees of the genus Cedrus, in the pine family. Three cedars are native to mountainous areas of the Mediterranean region and one to the western Himalayas. These "true" cedars are the Atlas cedar (C. atlanded), the Cyprus cedar (C. brevifolia), the deodar (C. deodara), and the cedar of Lebanon (C. libani). Cedarwood is light, soft, resinous, and durable, even when in contact with soil or moisture. Many other conifers known as cedars resemble true cedars in being evergreen and in having aromatic, often red or red-tinged wood that in many cases is decay-resistant and insect-repellent. The giant arbor vitae, incense cedar, and some junipers (red cedar) provide the familiar "cedarwood" of pencils, chests, closet linings, and fence posts. See also white cedar.

Cedar Breaks National Monument Preserve, southwestern Utah, U.S. Established as a national monument in 1933, it consists of a vast natural amphitheatre (10 sq mi [26 sq km]) eroded in a limestone escarpment. Iron and manganese oxide impurities in the cliff produce an amazing variety of colours that change constantly.

Cedar Rapids City (pop., 2000: 120,758), eastern Iowa, U.S. Originally called Rapids City, it was settled in the 1830s next to rapids of the Cedar River, a source of waterpower. With the coming of the railroads, it developed as a grain and livestock market. Neighbouring Kingston was annexed in 1870, and Kenwood Park in 1926. Its manufactures include electronic equipment and farm machinery. It was the home of the artist Grant Wood.

Cedar River River, northern central U.S. Flowing from southeastern Minnesota southeasterly across Iowa, it joins the Iowa River about 20 mi (32 km) from the Mississippi River. Over its 329-mi (529-km) course it passes through many cities, including Cedar Rapids. The river is named for the stands of red cedar along its lower course.

ceiling Overhead surface of a room, and the underside of a floor or roof.

Suspended ceilings, which hang from the beams above, are used to conceal construction, mechanical equipment, wiring, and light fixtures. During the Renaissance, ceilings were often coffered (see coffer), vaulted (see vault), or transformed into one large framed painting.

Cela (Trulock) Vtha-la\, Camilo Jose (b. May 11, 1916, Iria Flavia, Spain — d. Jan. 17, 2002, Madrid) Spanish writer. As a young man Cela served with Francisco Franco's forces in the Spanish Civil War; his literary works, however, represent a renunciation of his former Falangist sympathies. Primarily novels, short narratives, and travel diaries of Spain and Latin America, they are characteristically experimental and innovative in form and content. He is sometimes credited with establishing tremendismo, a narrative style tending to emphasize violence and grotesque imagery. He is perhaps best known for his first novel, The Family of Pascual Duarte (1942); other works include The Hive (1951) and the avant-garde San Camilo, 1936 (1969). In 1989 he was awarded the Nobel Prize for Literature.

celadon Chinese, Korean, Siamese, and Japanese stoneware decorated with glazes the colour range of which includes greens of various shades, olive, blue, and gray. The colours are the result of a wash of slip (liquefied clay) containing a high proportion of iron that is applied to the body before glazing. The iron interacts with the glaze during the firing and colours it. Celadons were prized in Eastern cultures long before their comparatively late introduction to the West. A wide demand led to their export to India, Persia, and Egypt in the Tang dynasty (618-907) and to most of Asia in the Song (960-1279) and Ming (1368-1644) dynasties. The ware was popular because of its beauty, because of a superstition that a celadon dish would break or change colour if poisoned food were put

into it, and because, to the Chinese, it resembled jade. Yue ware, first made in the Han dynasty (206 bc-ad 220), is the earliest celadon.

Celan Vtsa-.lanV Paul orig. Paul Antschel (b. Nov. 23, 1920, Cernauti, Rom. — d. May 1, 1970, Paris, France) Romanian poet who wrote in German. When Romania came under Nazi control during World War II, Celan, a Jew, was sent to a forced-labour camp; his parents were murdered. He moved to Vienna in 1947 and published his first volume of poetry, The Sand from the Urns, in 1948. His second volume, Poppy and Memory (1952), established his reputation in West Germany. He produced seven more volumes before taking his own life by drowning in the Seine. Celan' s dense and complex verse is marked by his experience of World War II; his early poem "Todesfuge" is one of the most famous poetic expressions of the Holocaust.

Celebes \'se-lo- l bez\ or Sulawesi \,su-l3-'wa-se\ Island (pop., including nearby islands, 2000: 14,946,488), Indonesia. One of the Greater Sunda Islands, it lies in the Malay Archipelago east of Borneo and has an area (including adjacent islands) of 74,005 sq mi (191,671 sq km). The island is mountainous; its tallest peak, Mount Rantekombola, reaches 11,335 ft (3,455 m). Muslims arrived in the 15th century. The Portuguese first visited in 1512 while developing the spice trade of the Moluccas. The first foreign settlement, in 1 607 by the Dutch at Makasar (now Ujung Pandang), initiated a power rivalry with the native sultans that lasted into the 20th century. Celebes joined Indonesia in 1950, though various rebellions against the central government have been ongoing.

Celebes black macaque or Celebes crested macaque

\mo-'kak\ Stump-tailed arboreal monkey (Macaca nigra) found in the rain-forests of Sulawesi (Celebes), Bacan, and nearby islands. Because it lacks a long tail, this macaque has often been incorrectly referred to as an ape. It has overhanging brows, a hairless black face, and a long, flat muzzle. It is 22-26 in. (55-65 cm) long without the 0.4-0.8-in. (1-2-cm) tail and has dark brown or black fur. The male, especially, bears a longitudinal crest of crown hair. It spends much of its time in trees, where it feeds on fruit. Certain peoples look on it as their ancestor.

Celebes Vse-l3-,bez\ Sea Part of the western Pacific Ocean. It is bordered by the Sulu Archipelago, Mindanao, the Sangihe Islands, Celebes, and Borneo. It extends 420 mi (675 km) north-south and 520 mi (837 km) east- west, occupying about 1 10,000 sq mi (280,000 sq km). It is connected with the Java Sea by the Makassar Strait. More than half of it is below 13,000 ft (4,000 m) deep, and its maximum depth is 20,406 ft (6,220 m). Traders and pirates from Borneo and nearby islands controlled the sea until it came under colonial rule in the late 19th century.

celeriac \s3-'ler-e-,ak\ or celery root Type of celery (Apium graveolens, variety rapaceum) grown for its knobby edible root, which is used as a raw or cooked vegetable. Originally cultivated in the Mediterranean and in northern Europe, it was introduced into Britain in the 18th century.

celery Herb {Apium graveolens) of the parsley family, native to the Mediterranean and the Middle East. The varieties with large, fleshy, succulent, upright leafstalks were developed in the late 1 8th century. Celery is usually eaten cooked in Europe but raw in the U.S. The tiny fruit, or seed, of the celery resembles the plant itself in taste and aroma and is used as a seasoning.

celestial coordinates Set of numbers used to pinpoint the position in the sky (see celestial sphere) of a celestial object. Coordinate systems used include the horizon system (altitude and azimuth), galactic coordinates, the ecliptic system (measured relative to the orbital plane of Earth), and the equatorial system (right ascension and declination, directly analogous to terrestrial latitude and longitude).

celestial mechanics Branch of astronomy that deals with the mathematical theory of the motions of celestial bodies. Johannes Kepler’s laws of planetary motion (1609-19) and Newton's laws of motion (1687) are fundamental to it. In the 18th century, powerful methods of mathematical analysis were generally successful in accounting for the observed motions of bodies in the solar system. One branch of celestial mechanics deals with the effect of gravitation on rotating bodies, with applications to Earth (see tide) and other objects in space. A modem derivation, called orbital mechanics or flight mechanics, deals with the motions of spacecraft under the influence of gravity, thrust, atmospheric drag, and other forces; it is used to calculate trajectories for ascent into space, achieving orbit, rendezvous, descent, and lunar and interplanetary flights.

Cedar of Lebanon (Cedrus libani)

G.E. HYDE-NATURAL HISTORY PHOTOGRAPHIC AGENCY/EB INC.

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celestial sphere Apparent surface of the heavens, on which the stars seem to be fixed. For the purpose of establishing celestial coordinate systems to mark the positions of heavenly bodies, it can be thought of as a real sphere at an infinite distance from Earth. Earth’s rotational axis, extended to infinity, touches this sphere at the northern and southern celestial poles, around which the heavens seem to turn. The intersection of the plane of Earth’s Equator with the sphere marks the celestial equator.

celiac \'se-le-,ak\ disease or nontropical sprue Digestive disorder in which people cannot tolerate gluten, a protein constituent of wheat, barley, malt, and rye flours. In celiac disease, gluten generates an immune response that damages the mucous lining of the small intestine; it is believed that a deficiency of gluten-digesting enzymes may underlie the disease. Poor nutrient absorption causes foul, bulky, fatty stools; malnutrition; stunting of growth; and anemia similar to pernicious anemia. It can run in families. Children begin having intermittent intestinal upset, diarrhea, and wasting at 6-21 months. In adults it usually begins after 30, with appetite loss, depression, irritability, and diarrhea. Symptoms in advanced cases stem from nutritional deficiencies and may require supportive measures. A high-protein diet low in glutens and saturated fats usually relieves symptoms.

celibacy Vse-ta-bs-seN The deliberate abstinence from sexual activity, usually in connection with a religious role or practice. It has existed in some form in most world religions. It may indicate a person’s ritual purity (sexual relations being viewed as polluting) or may be adopted to facilitate spiritual advancement (as sexual activity would take place only within the bonds of matrimony, marriage and family were seen as an entangling distraction). In shamanistic religions, shamans are often celibate. In Hinduism, “holy men” (or women) who have left ordinary secular life to seek final liberation are celibate. Buddhism began as a celibate order, though many sects have since given up celibacy. Chinese taoism has monastics and independent celibate adepts. Islam has no institutional celibacy, but individuals may embrace it for personal spiritual advancement. Judaism has prescribed periods of abstinence, but long-term celibacy has not played a large role. The early Christian church tended to regard celibacy as superior to marriage. Since the 12th century it has been the rule for Roman Catholic clergy, though clerical celibacy was never adopted by Protestantism.

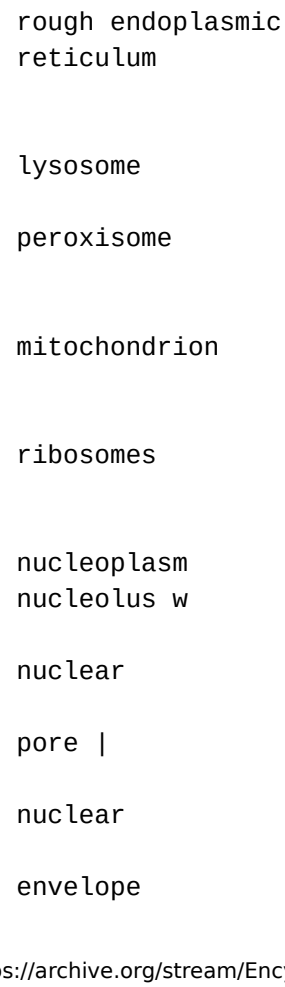
Celine \sa-'len\, Louis-Ferdinand orig. Louis-Ferdinand Destouches (b. May 27, 1894, Courbevoie, near Paris, France — d. July 1, 1961, Meudon) French writer. Celine was born into poverty. In World War I he suffered wounds and shell shock, the mental and physical effects of which lingered throughout his life. From 1924 he practiced medicine. His Journey to the End of Night (1932), about a man’s tortured search for meaning, is written in a vehement and disjointed style that marked him as a major innovator. Death on the Installment Plan (1936) is a bleak

portrayal of a world bereft of value, beauty, and decency. He thereafter became increasingly conservative, anti-Semitic, and misanthropic. After World War II he fled to Denmark as a suspected Nazi collaborator, but he was later exonerated. His works include the trilogy Castle to Castle (1957), North (1960), and Rigadoon (1969).

cell In biology, the basic unit of which all living things are composed; the smallest structural unit of living matter that is able to function independently. A single cell can be a complete organism in itself, as in bacteria and protozoans. Groups of specialized cells are organized into tissues and organs in multicellular organisms such as higher plants and animals. There are two distinct types of cells: prokaryotic cells, found only in bacteria (including blue-green algae, or cyanobacteria), and eukaryotic cells, composing all other life-forms. Though the structures of prokaryotic and eukaryotic cells differ (see prokaryote, eukaryote), their molecular compositions and activities are very similar. The chief molecules in cells are nucleic acids, proteins, and polysaccharides. A cell is bounded by a membrane that enables it to exchange certain materials with its surroundings. In plant cells, a rigid cell wall encloses this membrane. See illustration above.

cell division See meiosis, mitosis

cell(ular) phone Wireless telephone that permits telecommunication within a defined area that may include hundreds of square miles, using radio waves in the 800-900 megahertz (MHz) band. To implement a cell-phone system, a geographic area is broken into smaller areas, or cells, usually mapped as uniform hexagrams but in fact overlapping and irregularly shaped. Each cell is equipped with a low-powered radio transmitter and receiver that permit propagation of signals among cell-phone users.



smooth

reticulum

Golgi complex
apparatus)

cell membrane
(plasma membrane)
— secretory vesicles

Principal structures of an animal cell. Cytoplasm surrounds the cell's specialized structures, or organelles. Ribosomes, the sites of protein synthesis, are found free in the cytoplasm or attached to the endoplasmic reticulum, through which materials are transported throughout the cell. Energy needed by the cell is released by the mitochondria. The Golgi complex, stacks of flattened sacs, processes and packages materials to be released from the cell in secretory vesicles. Digestive enzymes are contained in lysosomes. Peroxisomes contain enzymes that detoxify dangerous substances. The centrosome contains the centrioles, which play a role in cell division. The microvilli are fingerlike extensions found on certain cells. Cilia, hairlike structures that extend from the surface of many cells, can create movement of surrounding fluid. The nuclear envelope, a double membrane surrounding the nucleus, contains pores that control the movement of substances into and out of the nucleoplasm. Chromatin, a combination of DNA and proteins that coil into chromosomes, makes up much of the nucleoplasm. The dense nucleolus is the site of ribosome production.

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cella \'se-la\ or naos \'na-,as\ Enclosed body of a temple (as distinct from the portico), in which the image of the deity was housed. In early Greek and Roman architecture it was usually rectangular, with an entrance at one end; the side walls were often extended to form a porch. In larger temples the cella was sometimes open to the sky. In the Byzantine architectural tradition, the naos is the area of a central-plan church where the liturgy is performed.

cellar Portion of a building beneath ground level, used for utilitarian and storage purposes. It is often called a basement, especially when constructed as part of a foundation. A cellar used for food storage (e.g., a root cellar) may be beneath a house or located outdoors, partly underground, with the upper part mounded over with earth to maintain fairly constant temperature and humidity; the entire enclosure may be concrete, or the floor may be of dirt and the ceiling of timber.

Cellini \ch9-'le-ne\/ Benvenuto (b. Nov. 1, 1500, Florence — d. Feb. 13, 1571, Florence) Italian sculptor and goldsmith active principally in Florence. Early in his career he worked in Rome, producing coins, medallions, seals, vessels, and a variety of other objects in precious and semiprecious metals. In 1540 he began his most famous work of this type, a gold saltcellar encrusted with

enamel, for Francis I at Fontainebleau; other royal commissions followed. For Cosimo I he produced large-scale sculpture in the round; the bronze Perseus (1545-53) in the Loggia dei Lanzi in Florence is his masterpiece. His fame owes as much to his autobiography as to his work as an artist; it achieved immediate

Saltcellar of Francis I, encrusted enamel and gold, by Benvenuto Cellini, 1 540; in the Kunsthistorisches Museum, Vienna.

COURTESY OF THE KUNSTHISTORISCHES MUSEUM, VIENNA

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popularity for its lively account of his tumultuous life and its vivid picture of Renaissance Italy.

cello \'che-,lo\ or violoncello Bowed, stringed instrument, the bass member of the violin family. Its full name means “little violone” — i.e., “little big viol.” Its proportions resemble those of the violin. Players hold its body between the legs, its weight supported by a metal spike that touches the floor. It has four strings, tuned an octave below those of the viola. The cello was developed in the early 16th century along with the violin and viola; later innovations increased its power. It gradually displaced the bass viola da gamba in the 18th century, especially as a continuo instrument. It has been essential to chamber music ensembles for 250 years. The modern orchestra includes 6 to 12 cellos. In the 19th and 20th centuries it was increasingly used as a solo instrument.

cellular automata (CA) Simplest model of a spatially distributed process that can be used to simulate various real-world processes. Cellular automata were invented in the 1940s by John von Neumann and Stanislav/ Ulam at Los Alamos National Laboratory. They consist of a two-dimensional array of cells that “evolve” step-by-step according to the state of neighbouring cells and certain rules that depend on the simulation. Though apparently simple, CAs are universal computers — that is, they can do any computer-capable computation. The best-known cellular automaton, John Conway’s “Game of Life” (1970), simulates the processes of life, death, and population dynamics.

celluloid \'sel-y3-,l6id\ Name for the first synthetic plastic material, developed in 1869. Made of a colloid of cellulose nitrate (nitrocellulose)

plasticized with camphor, it is tough, cheap to produce, and resistant to water, oils, and dilute acids. It found a great variety of uses in combs, films, toys, and many other mass-produced consumer goods. Though it has been replaced in many uses by nonflammable synthetic polymers (originally cellulose acetate and Bakelite, then a host of others), it is still manufactured and used.

cellulose Complex carbohydrate (polysaccharide) consisting of 1,000-3,000 or more glucose units in a linear chain structure that can pack into fibres of great tensile strength. The basic structural component of plant cell walls, cellulose is the most abundant of all naturally occurring organic compounds (90% of cotton and 50% of wood). Mammals (including humans) cannot digest cellulose, but bacteria in the rumens of cattle and other ruminants and protozoans in the gut of termites produce enzymes that can break it down. Soil fungi can also break down cellulose. Its most important uses are in wood, paper, and fibre products, as an ethanol and methanol source, and specialized applications. Cellulose derivatives are used in plastics, photographic films, rayon fibres, cellophane, coatings, explosives (e.g., nitrocellulose), and foods (e.g., the stabilizer and thickener carboxymethylcellulose).

Celsius \'sel-se-3s\, Anders (b. Nov. 27, 1701, Uppsala, Swed. — d. April 25, 1744, Uppsala) Swedish astronomer. He taught at the University of Uppsala from 1730 to his death. In 1733 he published a collection of 316 observations of the aurora borealis. In 1744 he built the Uppsala Observatory. He is best known for his invention of the Celsius (often called centigrade) thermometer scale (1742), which set the freezing point of water at 0° and the boiling point of water at 100°.

Celsus Vsel-sosV, Aulus Cornelius (fl. 1st century ad) Roman medical writer. His famous treatise De medicina, a major source of knowledge of early medicine, shows that it was remarkably advanced, urging cleanliness and use of antiseptics, describing facial skin grafting, and stating the four cardinal signs of inflammation. The book’s three parts discuss diseases requiring diet, drug, or surgical therapy.

Celt Vkelt, 'selt\ Any member of an early Indo-European people who spread over much of Europe from the 2nd millennium to the 1st century bc. They were absorbed into the Roman Empire as Britons, Gauls, Boii, Galatians, and Celtiberians. Early archaeological evidence (c. 700 bc) comes from the Hallstatt site in Austria. People of this Iron Age culture controlled trade routes along the Rhone, Seine, Rhine, and Danube rivers. As they moved west, Hallstatt warriors introduced the use of iron, which helped them dominate other Celtic tribes. By the mid 5th century bc, the La Tene culture emerged along the Rhine and moved into eastern Europe and the British Isles. Celts sacked Rome c. 390 and raided the whole peninsula, then settled south of the Alps (Cisalpine Gaul) and menaced Rome until they were defeated in 225 bc. In the Balkans, they sacked Delphi in 279 but were defeated by the Aetolians. They crossed to Anatolia and looted until they were subdued by Attalus I about 230 bc. Rome controlled Cisalpine Gaul by 192 and in 124 took territory beyond the Alps. In Transalpine Gaul, from the Rhine and the Alps west, the Celts were pressed by Germanic tribes from the west and Romans from the south. By 58 Julius Caesar had begun campaigns to annex all of Gaul. Celtic settlement of Britain and Ireland is deduced from archaeological and linguistic evidence. The Celtic social system comprised a warrior

aristocracy and freemen farmers; Druids, with magico-religious duties, ranked higher than warriors. They had a mixed farming economy. Their oral literary composition was highly developed, as was their art; they manufactured gold and silver jewelry, swords and scabbards, and shields inlaid with enamel.

Celtiberia \ l sel-t9- , bir-e-o\ Mountainous district, ancient Spain. Located in northeastern Spain between the Ebro and Tagus rivers, it had long been inhabited before it was occupied in the 3d century bc by tribes of mixed Iberian and Celtic stock. The Celtiberians first submitted to Rome in the early 2nd century bc but were not completely dominated until 1 33 bc. Excavated horse bits, daggers, and shield fittings attest to their warlike nature.

Celtic \'kel-tik\ languages Branch of the Indo-European language family spoken across a broad area of western and central Europe by the Celts in pre-Roman and Roman times, now confined to small coastal areas of northwestern Europe. Celtic can be divided into a continental group of languages (all extinct) and an insular group. Attestation of Insular Celtic begins around the time Continental Celtic fades from the scene as Celtic tongues gave way to Latin and other languages on the European continent. The Insular Celtic languages are conventionally divided into Goidelic (Irish, Manx, and Scottish Gaelic) and Brythonic (Welsh, Cornish, and Breton). Traditional Cornish was supplanted by English at the end of the 18th century. Manx, spoken on the Isle of Man, expired in the 20th century with the death of the last reputed native speaker in 1974. Both Manx and Cornish have been revived by enthusiasts, though neither can be considered community languages.

Celtic religion Beliefs and practices of the ancient Celts of Gaul and the British Isles. Celtic worship centred on the interplay of the divine element with the natural world. Springs, rivers, and hills were thought to be inhabited by guardian spirits, usually female. Some gods were widely worshiped; lesser deities were associated with particular tribes or places. The most honoured god was Lugus, who was skilled in all the arts. Cernunnos was lord of the animals; the goddess of mares and fertility was called Epona (Gaul), Macha (Ireland), or Rhiannon (Britain). Goddesses often came in groups of three. The priests of Celtic religion were the Druids; they maintained an oral tradition and left no writings. Seasonal festivals included Samhain (November 1), which marked summer’s end and served as a feast of the dead, and Beltane (May 1). Oak trees, holly, and mistletoe were considered sacred. The Celts believed in life after death as well as transmigration of souls. See also Bran; Brigit.

cement Agent that binds concrete and mortar. Cements are finely ground powders that, when mixed with water, set to a hard mass. The cement of 2,000 years ago was a mixture of ash and lime. Volcanic ash mined near the city of Puteoli (now Pozzuoli), near Naples, was particularly rich in essential aluminosilicate minerals, giving rise to the pozzolana cement of the Roman era. See also Portland cement.

cementation In geology, the hardening and welding of clastic sediments (those formed from preexisting rock fragments) by the precipitation of mineral matter in the pore spaces. It is the last stage in the formation of sedimentary rock. Many minerals may act as cements; the most common is silica (generally quartz), but calcite and other carbonates also occur, as do iron oxides, barite, anhydrite, zeolites, and clay minerals.

Cenis \s9-'ne\, Mount French Mont Cenis \,mo n -S3- , ne\ Italian

Moncenisio Vmon-cha-'ne-zyoX Massif and pass, Alps. Located in southeastern France west of Turin, Italy, the pass was an invasion route from earliest times and is traversed by a road 24 mi (38 km) long, built by Napoleon in 1803-10. The road climbs to Mount Cenis Pass (elevation 6,834 ft [2,083 m]) and passes between two peaks more than 8,200 ft (2,500 m) high. The Mount Cenis railway tunnel, 8.5 mi (14 km) long, was the first great tunnel through the Alps (opened 1871). The road tunnel, about 8 mi (13 km) long, opened in 1980.

Cennini \chan-'ne-ne\, Cennino (d'Andrea) (b. c. 1370, near Florence — d. c. 1440, Florence) Italian painter and writer active in Florence. A few surviving paintings are attributed to him, but he is best known

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as the author of II libro dell’ arte (1437; The Craftsman’s Handbook), the most important sourcebook on artistic practice in the late Middle Ages. His detailed descriptions of tempera and fresco painting reflect the technical procedures of the great Florentine painting tradition. He believed that painting held a high place among occupations because it combined theory or imagination with the skill of the hand.

cenotaph \'se-na-,taf\ (Greek: “empty tomb”) Monument, sometimes in the form of a tomb, to a person buried elsewhere. Ancient Greek writings tell of many cenotaphs, none of which survives. Existing cenotaphs of this type are found in churches (e.g., in Santa Croce, Florence, where there are memorials to Dante, Niccolo Machiavelli, and Galileo). The term is now applied to national war memorials.

Cenozoic \,se-n3-'z6-ik\ Era Third of the major eras of Earth history, and the interval of time during which the continents assumed their modern configurations and geographic positions. It was also the time when the Earth’s flora and fauna evolved toward those of the present. The Cenozoic, from the Greek for “recent life,” began c. 65 million years ago and is divided into two periods, the Tertiary (65-1.8 million years ago) and the Quaternary (1.8 million years ago to the present).

censor In ancient eastern Asia, a government official whose primary duty was to scrutinize the conduct of officials and rulers. During the Qin (221-206 bc) and Han (206 bc-ad 220) dynasties, the censor’s function was to criticize the emperor’s acts, but in later periods the censorate was expanded and became an instrument for imperial control of the bureaucracy. Censors checked important documents, supervised construction projects, reviewed judicial proceedings, kept watch over state property, and looked for cases of subversion and corruption.

censorship Act of changing or suppressing speech or writing that is considered subversive of the common good. In the past, most governments believed it their duty to regulate the morals of their people; only with the rise in the status of the individual and individual rights did censorship come to seem objectionable. Censorship may be preemptive (pre-

venting the publication or broadcast of undesirable information) or punitive (punishing those who publish or broadcast offending material). In Europe, both the Roman Catholic and Protestant churches practiced censorship, as did the absolute monarchies of the 17th and 18th centuries. Authoritarian governments such as those in China, Cuba, Saudi Arabia, and the former Soviet Union have employed pervasive censorship, which is generally opposed by underground movements engaged in the circulation of samizdat literature. In the U.S. in the 20th century, censorship focused largely on works of fiction deemed guilty of obscenity (e.g., James Joyce's Ulysses and D.H. Lawrence's Lady Chatterley's Lover), though periodic acts of political censorship also occurred (e.g., the effort to purge school textbooks of possible left-wing content in the 1950s). In the late 20th century, some called for censorship of so-called hate speech, language deemed threatening (or sometimes merely offensive) to various subsections of the population. Censorship in the U.S. is usually opposed by the American Civil Liberties Union. In Germany after World War II it became a crime to deny the Holocaust or to publish pro-Nazi publications. See also Pentagon Papers.

census Enumeration of people, houses, firms, or other important items in a country or region at a particular time. The first U.S. population census was taken in 1790 to establish a basis for representation in Congress. Censuses were taken in England, France, and Canada in 1801, 1836, and 1871, respectively. China was the last major country to report a census, in 1953. Census information is obtained by using a fixed questionnaire covering such topics as place of residence, sex, age, marital status, occupation, citizenship, language, ethnicity, religious affiliation, and education. From the responses demographers derive data on population distribution, household and family composition, internal migration, labor-force participation, and other topics. See also demography.

centaur Vsen-,t6r\ In Greek mythology, one of a race of creatures, part horse and part man, living in the mountains of Thessaly and Arcadia. They were best known for their battle with the Lapiths, occasioned by their attempt to carry off the bride of a Lapith prince. Centaurs were often depicted drawing Dionysus' chariot or ridden by Eros, in reference to their drunken and amorous habits. Their king Chiron, however, was notable for being civilized, gentle, and the tutor of heroes.

Centaur object Icy body, similar to an asteroid in size but to a comet in composition, that orbits the Sun mainly between the orbits of Jupiter and Neptune. The first known Centaur object, Chiron, was found in 1977, but its affinity with comets was not recognized until more than a decade later. Subsequently, dozens of Centaur objects have been reported. They are thought to have originated in the Kuiper belt, a vast reservoir of comet nuclei beyond Neptune's orbit.

Center Party German political party formed to support Roman Catholic interests. It was active in the Second Reich from the 1870s, when it came into conflict with Otto von Bismarck in the Kulturkampf, to 1933, when it was dissolved by the Nazi-dominated government. It was the first party of imperial Germany to cut across class and state lines, but because it represented the Roman Catholics, who were concentrated in southern Germany, it never won a parliamentary majority.

centering See falsework

Centers for Disease Control and Prevention (CDC) Agency of the U.S. Department of Health and Human Services, headquartered in Atlanta, whose mission is “to promote health and quality of life by preventing and controlling disease, injury, and disability.” Part of the Public Health Service, it was founded in 1946 as the Communicable Disease Center to fight malaria and other contagious diseases. As its scope widened to polio, smallpox, and disease surveillance, the name was changed to the Center for Disease Control and later pluralized. It now subsumes health statistics, infectious diseases, and environmental health; a National Immunization Program; and an Office on Smoking and Health. It consolidates disease-control data, health promotion, and public health programs, and it provides grants for studies and programs, health information to health care professionals and the public, and publications on epidemiology. Today it is regarded as perhaps the world’s foremost epidemiological centre.

centipede Any of about 2,800 species (class Chilopoda) of long, flattened, many- segmented arthropods having one pair of legs on each segment except the hindmost. Centipedes remain under stones, bark, and ground litter by day; at night they prey on other small invertebrates.

They move rapidly on 14-177 pairs of legs and have one pair of long, many-jointed antennae and a pair of jawlike, venomous claws just behind the head. The 1-in. (2.5-cm) house centipede of Europe and North America is the only species common in dwellings. The largest centipedes, found in the tropics, may grow as long as 1 1 in. (28 cm) and can inflict severe bites.

CENTO See Central Treaty Organization

Central African Republic formerly Ubangi-Shari Ui-.baq-ge-‘shar-e\ Republic, central Africa. Area: 240,324 sq mi (622,436 sq km). Population (2005 est.): 4,038,000. Capital: Bangui. The people form heterogeneous ethnic groups, with the Banda, Baya (Gbaya), Mandjia, and Ngbaka constituting more than two-thirds of the inhabitants. Languages: French, Sango (both official), several others. Religions: Christianity (mostly other Christians [largely unaffiliated and independent]; also Roman Catholic, Protestant), Islam, traditional beliefs. Currency: CFA franc. A landlocked country, it consists of a large rolling plateau. The northern half is characterized by savanna and is drained by tributaries of the Chari River. The southern half is densely forested. The country has a developing free-enterprise economy of mixed state and private structure, with agriculture as the main component. It is a republic with one legislative body; its chief of state is the president, assisted by the prime minister. For several centuries before the arrival of Europeans, the territory was exploited by slave traders. The French explored and claimed central Africa and in 1889 established a post at Bangui. They subsequently partitioned the territory into several colonies, one of which was Ubangi-Shari (Oubangui-Chari), the future Central African Republic; it later became part of French Equatorial Africa. Ubangi-Shari became a French overseas territory in 1946. It became an autonomous republic within the French

Community in 1958 and achieved independence in 1960. In 1965 the military overthrew a civilian government and installed Jean-Bedel Bokassa, who in 1976 renamed the country the Central African Empire. He was overthrown in 1979 and the former name was restored, but the military

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Central America Southern portion of North America (pop., 2005 est.: 39,806,000). It extends from the southern border of Mexico to the northwestern border of Colombia and from the Pacific Ocean to the Caribbean Sea. It includes Guatemala, Belize, Honduras, El Salvador, Nicaragua, Costa Rica, and Panama. Some geographers also include five states of Mexico: Quintana Roo, Yucatan, Campeche, Tabasco, and Chiapas. Area: 201,594 sq mi (522,129 sq km). Two-thirds of the population is of mixed American Indian and Spanish ancestry. Language: Spanish (official), except Belize (English, official); also American Indian languages. Religion: chiefly Roman Catholicism. The region is largely hilly or mountainous, with humid swamps and lowlands extending along both coasts. Tajumulco Volcano, in western Guatemala, is the highest point, elevation 13,845 ft (4,220 m). The region has some 40 volcanoes, many of them active, and is prone to severe seismic activity. The volcanic zones have fertile soil and are productive agricultural areas. Central America was long inhabited by indigenous peoples, including the Maya, before the Spanish arrived and conquered the region in the early 16th century; they continued to rule for about 300 years. Christopher Columbus skirted the Atlantic coast from Honduras to the Gulf of Darien in 1502; the first European settlement (1510) was on the gulf. Spain organized the region (except Panama) into the Captaincy General of Guatemala (c. 1543). The English arrived in the 17th century, settling what became British Honduras (Belize). Independence from Spanish rule came in 1821, and in 1823 the United Provinces of Central America was formed (Guatemala, El Salvador, Honduras, Nicaragua, and Costa Rica). British Honduras, still a colony, did not join the federation, and Panama remained part of Colombia. In 1824 the federation adopted a constitution, but in 1838 Costa Rica, Honduras, and Nicaragua seceded, thus effectively terminating the federation. Treaties of amity were drawn up at a conference of Central American states in Washington, D.C. (1923). The Central American Common Market was established in 1960 to create a customs union and promote economic cooperation.

Central Asian arts Literary, performing, and visual arts of Afghanistan, Azerbaijan, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Tibet, Turkmenistan, Uzbekistan, and parts of China and Russia. The term usually denotes only those traditions not influenced by the Islamic arts. Tibetan developed as a literary language from the 7th century as a result of cultural contacts with neighbouring Buddhist countries to the south, on the

Indian subcontinent. Most works produced between the 7th and 13th centuries are skillful translations of Buddhist works from Sanskrit, after

which a vast body of orthodox Buddhist works of purely Tibetan origin was built up. Mongolian literature began in the 13th century with chronicles of Genghis Khan and his successors, but from the late 16th century Mongolian literature was profoundly influenced by Buddhism. The variety of musical styles in Central Asia ranges from the systematically organized classical music of the Turkic peoples, to the notated religious chants of Buddhists in Tibet, to the highly varied folk music styles of the Mongols, Siberians, and numerous other ethnic groups. Two main types of performance predominate throughout Tibet, Nepal, Sikkim, Bhutan, and Mongolia: those related to shamanism and those derived from Buddhism. Music performed on drums and stringed instruments accompanied shamanistic trances. The performance of Buddhist monastic dances and morality plays is also accompanied by various drums and horn instruments. The performing arts of the Turkic peoples are very different from these other traditions because of the influence of Islam. The tribes of Central Asia shared, for the most part, a “nomadic” Scytho-Altaic visual art that favoured animal and hunting motifs in objects such as belts and jewelry. Contacts with the Greco-Roman world and with India, Iran, and China also left their mark; Hellenistic influence culminated in the Kushan style of Gandhara. The most important pre-Islamic influence on Central Asia’s visual arts, however, was Buddhism, which was reflected in the subject matter of sculptures and bas-reliefs. Nepal’s traditions in architecture and painting were adaptations of those of India, whether the themes were Hindu or Buddhist. Buddhist religious art was gradually introduced into Tibet from the 8th century, and a distinctive Tibetan imagery was subsequently developed. See also Gandhara art; Kushan art; Scythian art.

central bank Institution, such as the U.S. Federal Reserve System, charged with regulating the size of a nation’s money supply, the availability and cost of credit, and the foreign exchange value of its currency (see foreign exchange). Central banks act as the fiscal agent of the government, issuing notes to be used as legal tender, supervising the operations of the commercial banking system, and implementing monetary policy. By increasing or decreasing the supply of money and credit, they affect interest rates, thereby influencing the economy. Modem central banks regulate the money supply by buying and selling assets (e.g., through the purchase or sale of government securities). They may also raise or lower the discount rate to discourage or encourage borrowing by commercial banks. By adjusting the reserve requirement (the minimum cash reserves that banks must hold against their deposit liabilities), central banks contract or expand the money supply. Their aim is to maintain conditions that support a high level of employment and production and stable domestic prices. Central banks also take part in cooperative international currency arrangements designed to help stabilize or regulate the foreign exchange rates of participating countries. Central banks have become varied in authority, autonomy, functions, and instruments of action, but there has been consistent increased emphasis on the interdependence of monetary and other national economic policies, especially fiscal policies and debt management policies. See also bank; investment bank; savings bank.

Central Intelligence Agency (CIA) Principal intelligence and counterintelligence agency of the U.S., established in 1947 as a successor to the World War II-era Office of Strategic Services. The law limits its activi-

ties to foreign countries; it is prohibited from gathering intelligence on U.S. soil, which is a responsibility of the Federal Bureau of Investigation. Officially a part of the U.S. Defense Department, it is responsible for preparing analyses for the National Security Council. Its budget is kept secret. Though intelligence gathering is its chief occupation, the CIA has also been involved in many covert operations, including the expulsion of Mohammad Mosaddeq from Iran (1953), the attempted Bay of Pigs invasion of Cuba (1961), and support of the Nicaraguan contras in the 1980s.

central limit theorem In statistics, any of several fundamental theorems in probability. Originally known as the law of errors, in its classic form it states that the sum of a set of independent random variables will approach a normal distribution regardless of the distribution of the individual variables themselves, given certain general conditions. Further, the mean (see mean, median, and mode) of the normal distribution will coincide with the (arithmetic) mean of the (statistical) means of each random variable.

central nervous system See nervous system

Central Pacific Railroad U.S. railroad company founded in 1861 by a group of California merchants including Mark Hopkins and Leland Stan-

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ford. It was built with land grants and subsidies from the Pacific Railway Act (1862); thousands of Chinese labourers were hired to build it. Its tracks joined with those of the Union Pacific on May 10, 1869, in Promontory, Utah, forming North America’s first transcontinental railroad. From 1884 it was leased to the Southern Pacific Co., with which it merged in 1959.

Central Park Public park, New York, New York, U.S. Located in Manhattan, it occupies an area of 840 acres (340 hectares). It was designed by Frederick Law Olmsted and opened in 1876; it was artificially landscaped to create an impression of wild and varied terrain. It includes footpaths and bicycle paths, athletic fields, boating lakes, and a zoo. Free public concerts and performances are frequent, notably the Shakespeare in the Park series at an open-air theatre. The Metropolitan Museum of Art adjoins the park.

Central Powers World War I coalition that was defeated by the Allied Powers. Its primary members were the German empire and Austria-Hungary, the “central” European states that were at war from August 1914 against France, Britain, and Russia. The Ottoman empire entered the war on the side of the Central Powers in October 1914, followed by Bulgaria in October 1915.

central processing unit See CPU

Central Treaty Organization (CENTO) originally Middle East Treaty Organization or Baghdad Pact Organization Mutual-security organization, originally composed of Turkey, Iran, Iraq, Pakistan, and Britain. It was formed in 1955, at the urging of the U.S. and Britain, to counter the threat of Soviet expansion into the Middle East. CENTO was never very effective. Iraq withdrew after its anti-Soviet monarchy was overthrown in 1959. In that same year the U.S. became an associate member, and CENTO'S headquarters were moved to Ankara, Tur. After the fall of Mohammad Reza Shah Pahlavi in 1979, Iran withdrew and CENTO was dissolved.

Central Valley Spanish Valle Central \'ba-ya-sen-'tral\ Valley, Chile. Located in central Chile between the Western Cordillera of the Andes Mountains and the coastal range, it extends about 400 mi (650 km) from the Chacabuco Range in the north to the Bio-Bio River in the south. The agricultural heartland of Chile, it was the original centre of European colonization beginning in the mid- 1500s, and it continues to be home to most Chileans. Santiago is at its northern end.

Central Valley Valley, California, U.S. Located between the Sierra Nevada and the Coast Ranges, it is more than 400 mi (640 km) long and 20-50 mi (32-80 km) wide. The Sacramento and San Joaquin rivers, which run through the valley, are fed by abundant rains and melting snows of the Sierras. Because of the irrigation made possible by numerous dams and canals, the area now contains some of the richest farmland in the U.S.

centrifugal \sen-'trif-y3-gol\ force Fictitious force, peculiar to circular motion, that is equal but opposite to the centripetal force that keeps a particle on a circular path (see centripetal acceleration). For example, a stone attached to a string and whirling in a horizontal circular path is accelerated toward the centre of its path by the tension in the string, the only force acting on the string. However, in a reference frame at rest with the stone, another force — the centrifugal force — must be introduced for Newton's laws of motion to apply. Centrifugal force is a useful concept in analyzing behaviour in rotating systems.

centrifugal \sen-'trif-y3-g9l\ pump Machine for moving liquids and gases. Its two major parts are the impeller (a wheel with vanes) and the circular pump casing around it. In the most common type, called the volute centrifugal pump, fluid enters the pump at high speed near the centre of the rotating impeller and is thrown against the casing by the vanes. The centrifugal pressure forces the fluid through an opening in the casing; this outlet widens progressively in a spiral fashion, which reduces the speed of the fluid and thereby increases pressure. Centrifugal pumps are used for many purposes, such as pumping liquids for water supply, irrigation, and sewage disposal systems. They are also used as gas compressors.

centrifuge Vsen-tro-.fyujV Machine that applies a sustained centrifugal force. Effectively, the centrifuge substitutes a similar, stronger force for that of gravity. Every centrifuge contains a spinning vessel; there are many configurations, depending on use. A revolving object exerts a force away from the centre of rotation (see Newton's laws of motion), called the centrifugal force; it is usually stated as so many "times gravity" or so many

"G," and may range from a few G for the basket in a home washing machine or an industrial separator to hundreds of thousands of G for centrifuges to separate isotopes of uranium or to purify vaccines.

centripetal \sen-'trip-9-t3l\ acceleration Property of the motion of an object traveling in a circular path. Centripetal describes the force on the object, directed toward the centre of the circle, which causes a constant change in the object's direction and thus its acceleration. The magnitude of centripetal acceleration a is equal to the square of the object's velocity v along the curved path divided by the object's distance r from the centre of the circle, or a = v 2 /r.

centroid In geometry, the centre of mass of a two-dimensional figure or three-dimensional solid. Thus the centroid of a two-dimensional figure represents the point at which it could be balanced if it were cut out of, for example, sheet metal. The centroid of a circle or sphere is its centre. More generally, the centroid represents the point designated by the mean (see mean, median, and mode) of the coordinates of all the points in a set. If the boundary is irregular, finding the mean requires using calculus (the most general formula for the centroid involves an integral).

centromere Vsen-trs-.mhA Structure in a chromosome that holds together the two chromatids. It is the point of attachment to the structure that pulls the chromatids to opposite ends of the cell during cell division (see mitosis). During the middle stage of mitosis, the centromere duplicates and the chromatid pair separates, each chromatid becoming a separate chromosome. Thus, when the cell divides, both daughter cells have complete sets of chromosomes.

century plant or American aloe or maguey \m9-'ga\ Species of AGAVE (Agave americana), of Mexico and the southwestern U.S. It takes many years (from five to 100) to mature, flowers only once, and then dies. It is widely cultivated for its large spiny leaves and enormous flower cluster, and may reach 20 ft (6 m) in height. Century plants provide the distinctive ingredient for the alcoholic drinks pulque and mescal.

Cephalonia or Cephallenia Largest of the Ionian Islands, western Greece. With Ithaca and smaller nearby islands, it forms the Kefallima department. The mountainous island occupies 302 sq mi (781 sq km) and rises to 5,341 ft (1,628 m) at Mount Amos. Argostolion, the chief town and a port on the southwestern coast, is the department capital. The island was an important Mycenaean centre, which the Romans seized in 1 89 bc. In the Middle Ages it was captured by Robert Guiscard. Later it was ruled by various Neapolitan and Venetian families. In 1809 it was taken by the British, then ceded to Greece in 1864. It experienced a devastating earthquake in 1953.

cephalopod Vse-fs-ls-.padV Any marine mollusk of the class Cephalopoda (e.g., cuttlefish, nautilus, octopus, and squid), which includes the most active and largest living invertebrates. Cephalopods are bilaterally symmetrical and typically have a highly developed centralized nervous system. Their image-forming eyes are similar in structure to vertebrate eyes, and their heads are armed with tentacles that have rows of round suction disks. Most cephalopods can change skin colour to blend in with their surroundings. All can swim, propelling themselves backward by expelling water forcefully. Most are carnivores that feed on fish, crustaceans, and other mollusks.

Cepheid \'sef-e-ad\ variable One of a class of variable stars whose period of variation is closely related to its luminosity and is therefore useful in measuring the distances to clusters of stars and galaxies. Named for

the prototype of this class found in the constellation Cepheus, classical Cepheids have periods from about 1 .5 days to over 50 days and are Population I stars (see Populations I and II). The longer the period of such a star, the greater its natural brightness; this relationship was discovered in 1912 by the American astronomer Henrietta Leavitt (b. 1868 — d. 1921).

Ceram or Seram Vsa-.rairA Island of the central Moluccas, Indonesia. It has an area of 6,621 sq mi (17,148 sq km). The terrain is mountainous and covered with tropical forests; seismic activity is common. Portuguese missionaries arriving in the 15th century found Hindu and Islamic influences present; the island came under nominal Dutch control c. 1650. During World War II the Japanese occupied it; after the war it became part of Indonesia.

ceramics Traditionally, objects created from such naturally occurring raw materials as clay minerals and quartz sand, by shaping the material and then hardening it by firing at high temperatures to make the object

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stronger, harder, and less permeable to fluids. The principal ceramic products are containers, tableware, bricks, and tiles. See also earthenware, porcelain, POTTERY, STONEWARE, TERRA-COTTA.

Ceratium \s3-'ra-she-9m\ Genus of one-celled aquatic protists. Members are dinoflagellates with both plant and animal characteristics. The cell is flattened horizontally and contains yellow, brown, or green pigments. Ceratium species are covered by a theca, or armour, composed of many textured plates that form one horn in the front and usually two in the back; these horns slow the sinking of the organism. The body form varies according to the salt content and temperature of the surrounding water: the spines tend to be short and thick in cold, salty water and long and thin in less salty, warmer water. Members form an important part of the plankton found in northern seas.

Cerberus Vs9r-b3-r3s\ In Greek mythology, the monstrous watchdog of the underworld. He was usually said to have three heads, though Hesiod says he had 50. Heads of snakes grew from his back, and he had a serpent’s tail. He devoured anyone who tried to escape Hades’s kingdom, and he refused entrance to living humans, though Orpheus gained passage by charming him with music. One of the labours of Heracles was to bring Cerberus up to the land of the living; after succeeding, he returned the creature to Hades.

cereal or grain Any grass yielding starchy seeds suitable for food. The most commonly cultivated cereals are wheat, rice, rye, oats, barley, corn, and sorghum. As human food, cereals are usually marketed in raw grain form or as ingredients of food products. As animal feed, they are consumed mainly by livestock and poultry, which are eventually rendered as meat, dairy, and poultry products for human consumption. They also are

used industrially in the production of a wide range of substances, such as glucose, adhesives, oils, and alcohols. Measured in acres planted, wheat is the world's most widely grown cereal crop; rice is the second, but more com is harvested than either. Grains are generally rich in carbohydrates and energy value but comparatively low in protein and naturally deficient in calcium and vitamin A. Breads are usually enriched to compensate for any nutritional deficiencies in the cereal used. Though often consumed in the areas where grown, cereal and cereal by-products are also major commodities in international trade.

cereal Prepared foodstuff of cereal grain. Cereals are used for both human and animal food. The first step in making cereal is milling, grinding the grain so that it can be easily processed. Modem automated systems employ steel cylinders, followed by air purification and numerous sievings to separate the endosperm from the outer coverings and the germ; com is milled by wet processes. Cereal products include minimally processed whole, crushed, or rolled grains, flour, cornstarch, meal (coarsely ground and unsifted grain), and pasta. Breakfast cereals include raw cereals such as oatmeal and farina (which must be boiled), shredded cereals (usually whole wheat that is boiled, dried, and cut), flaked cereals (usually corn that is broken down into grits and cooked under pressure with flavoring syrup before being pressed and toasted), puffed cereals (grains heated in a pressure chamber and then released to cause expansion), and granular cereals (flour-based cereals made from dough that is cooked and ground into small bits). All cereals are high in starch.

cerebellum V.ser-s-'bel-omX Part of the brain that integrates sensory input from the inner ear and from proprioceptors (see proprioception) in muscle with nerve impulses from the cerebrum (see cerebral cortex), coordinating muscle responses to maintain balance and produce smooth, coordinated movements. Located below the cerebral hemispheres and behind the upper medulla oblongata and pons, each of its two connected hemispheres has a core of white matter within a cortex of gray matter. Disorders usually produce neuromuscular disturbances, in particular ataxia.

cerebral cortex \s3-'re-brel, 'ser-o-broH Layer of gray matter that constitutes the outer layer of the cerebrum and is responsible for integrating sensory impulses and for higher intellectual functions. It is divided into four lobes, roughly defined by major surface folds; sometimes the limbic system, or limbic lobe, is considered to be a fifth lobe. The frontal lobe controls motor activity and speech, the parietal controls touch and position, and the temporal lobe handles auditory reception and memory. The occipital lobe at the back of the brain holds the brain's major visual-reception area. The limbic lobe controls smell, taste, and emotional responses.

cerebral palsy Paralysis resulting from abnormal development or damage to the brain before or soon after birth. Cases are of four main types: spastic, with spasms contracting the extremities, and often mental retardation and epilepsy; athetoid, with slow, changing spasms in the face, neck, and extremities, grimacing, and inarticulate speech (dysarthria); ataxic, with poor coordination, muscle weakness, an unsteady gait, and difficulty performing rapid or fine movements; and mixed, in which symptoms of two or more types are present.

cerebral seizures See epilepsy

cerebrospinal \s3-,re-bro- , spI-n 3 l\ fluid (CSF) Clear, colourless liquid that surrounds the brain and spinal cord and fills the spaces in them. It helps support the brain, acts as a lubricant, maintains pressure in the skull, and cushions shocks. Analysis of CSF obtained by a spinal tap (lumbar puncture) helps diagnose a number of disorders, including meningitis and hemorrhage in the central nervous system.

cerebrum Nso-'re-brom, 'ser-a-bromV Largest part of the brain. The two cerebral hemispheres consist of an inner core of myelinated nerve fibres, the white matter, and a heavily convoluted outer cortex of gray matter (see cerebral cortex). Nerve fibres in the white matter connect functional areas of the cortex in the same hemispheres, connect functional areas of the cortex in opposite hemispheres, and connect the cerebral cortex to lower centres (e.g., the spinal cord). A front-to-back fissure divides the cerebrum’s two hemispheres. Each hemisphere controls the opposite side of the body. The corpus callosum, a thick band of white matter, connects them, allowing integration of sensory data and responses from both sides of the body. Other important cerebral structures include the hypothalamus and the thalamus.

Ceres Vsir-ez\ In Roman religion, the goddess of the growth of food plants, sometimes worshiped in association with the earth goddess Tellus.

Her cult was overlaid by that of Demeter, who was worshiped in Greece and Sicily. According to tradition, her cult was introduced into Rome in 496 bc to check a famine.

Her temple on Aventine Hill was known as a centre of plebeian religious and political activities and for its artwork.

Ceres \'sir-,ez\ Largest known asteroid in the solar system and the first discovered, in 1801. Named after the Roman goddess Ceres, it revolves around the Sun in 4.6 Earth years and is about 575 mi (925 km) across.

cereus Any of various large cacti (genus Cereus and related genera) of the western U.S. and tropical New World, including the saguaro and the organ-pipe cactus (Lemairocereus thurberi, also L. marginatus or C. thurberi). The genus Selenicereus (night-blooming cereus, or moon cactus), containing about 20 species, is known for its large, usually fragrant, night-blooming white flowers, among the largest in the cactus family. The queen-of-the-night (S . grandiflorus), the best-known night-blooming cereus, is often grown indoors.

Cerf VsorfV, Bennett (Alfred) (b. May 25, 1898, New York, N.Y., U.S. — d. Aug. 27, 1971, Mount Kisco, N.Y.) U.S. publisher and editor.

With Donald S. Klopfer, in 1925 Cerf acquired the Modem Library imprint, which subsequently became a highly profitable series of reprints of classic books. In 1927 they began publishing books other than Modern Library titles as Random House, of which Cerf served as president (1927-65) and chairman (1965-70). He became known as an opponent of censorship and as the publisher of many eminent authors. An inveterate punster and raconteur, he edited anthologies of humour, short stories, and plays, wrote syndicated newspaper columns, and appeared on the popular television show “What’s My Line?” (1952-68).

cerium \'sir-e-am\ Chemical element, a rare earth metal of the lanthanide series (hence having many properties of the transition elements), chemical symbol Ce, atomic number 58. It is iron-gray and fairly soft and ductile.

Ceres, Classical sculpture; in the Vatican Museum.

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Found in many ores, it is about as abundant as copper and three times as abundant as lead. The metal is used in alloys and other metallurgical applications and (because it oxidizes strongly and rapidly) in illumination, ignition, and signaling devices and in propellants. Misch metal, used in lighter flints, is 50% cerium. Cerium compounds (in which it has valence 3 or 4) are used in the mantles of lanterns, in the ceramic, photographic, and textile industries, and in analytical chemistry.

CERN in full Organisation Europeenne pour la Recherche Nucleaire formerly Conseil Europeen pour la Recherche Nucleaire. International scientific organization established for collaborative research into subnuclear physics. Headquartered in Geneva, CERN includes extensive facilities at sites on both sides of the Swiss-French border. The results of its experimental and theoretical work are made generally available. It was established in part in order to reclaim European physicists who had emigrated to the U.S. as a result of World War II. In 2000 it had 20 European member nations and several nations with observer status.

Cernunnos \ker-'nii-nos\ In Celtic religion, a deity worshiped as “lord of wild things.” He wore stag antlers and sometimes carried a torque (sacred neck ornament). He was worshiped primarily in Britain, but there are also traces of his cult in Ireland. He is probably the source for the horned god that appears in Christian medieval manuscripts as a symbol of the Antichrist.

Cerrito, Fanny orig. Francesca Teresa Giuseppa Raffaela

Cerrito (b. May 11, 1817, Naples, Italy — d. May 6, 1909, Paris, Fr.) Italian ballerina and choreographer. She made her debut in Naples (1832) and gained international fame in London (1 840 — 48). She was known for the brilliance, strength, and vivacity of her dancing. Her greatest role was in Ondine (1843), created for her by Jules Perrot. Cerrito married her regular partner, Arthur Saint- Leon, in 1845. In 1854 she both choreographed and danced in Gemma at the Paris Opera. She retired in 1857. She was one of the few women in the 19th century to achieve distinction as a choreographer.

Cerro Gordo \'ser-o-'g6r-do\. Battle of Confrontation between U.S. and Mexican troops in April 1847 when U.S. forces under Winfield Scott first met serious resistance in the Mexican War. As Scott's army marched from Veracruz to Mexico City, it attacked an entrenched Mexican force of 12,000 under Antonio Santa Anna at a mountain pass near Cerro Gordo. Scott's troops routed the Mexicans, who left 1,130 casualties; the U.S. lost 63 men.

Cersobleptes \,ser-so-'blep- l tez\ (d. 342 bc) King of Thrace (360-342). He inherited a war with Athens and was opposed internally by two pretenders to the throne. To Athens he ceded the Thracian Chersonese (357); to the pretenders he relinquished western Thrace. He forged an alliance with Athens to oppose Macedonia, but was later excluded from the peace of 346 by Philip II.

certificate, digital See digital certificate

certificate of deposit (CD) Receipt from a bank acknowledging the deposit of a sum of money. The most common type, the time certificate of deposit, is for a fixed-term interest-bearing deposit in a large denomination. It consequently pays higher interest than a savings account, though the investor who withdraws money before its maturity date is subject to a penalty. Introduced in the early 1960s, CDs have become a popular method of saving.

certiorari V.sor-sho-'rar-eX In law, a writ issued by a superior court for the reexamination of an action of a lower court. The writ of certiorari was originally a writ from England's Court of Queen's (King's) Bench to the judges of an inferior court; it was later expanded to include writs from the equity (chancery) courts. In the U.S., certiorari is the most common means by which cases from the United States Courts of Appeals are reviewed by the Supreme Court of the United States. For the Supreme Court to issue a writ of certiorari, at least four justices must agree to hear the case.

Cervantes \s3r-'van-,tez\ (Saavedra), Miguel de (b. Sept. 29?, 1547, Alcala de Henares, Spain — d. April 22, 1616, Madrid) Spanish novelist, playwright, and poet, the most celebrated figure in Spanish literature. After studying in Madrid, Cervantes joined the Italian infantry, fought the Turks at Lepanto, and was captured with his brother and sold into slavery in Algiers for five years. Back in Spain, his chronic financial problems and tangled affairs led to brushes with the law and brief impris-

onment. While in tedious civil-service employment, he wrote the pastoral romance La Galatea (1585) and plays, poetry, and short stories, to small success. His marvelous creation Don Quixote (1605, 1615), brought immediate success and literary eminence, if not riches. It parodies chivalric romances of the day with the comic adventures of a bemused eld-

erly knight who sets out on his old horse, Rosinante, with his pragmatic squire, Sancho Panza. Often considered the first and certainly one of the great novels, it has influenced many writers and inspired numerous creations in other genres and media. Cervantes also published a large set of eight comedies and eight interludes for the stage (1615) and the romance The Labors of Persiles and Sigismunda (1617).

cervical spondylosis \,span-d3-'lo-s3s\ Degenerative disease of the neck vertebrae. Compression of the spinal cord and cervical nerves by narrowing of spaces between vertebrae causes radiating neck or arm pain and stiffness, restricted head movement, headaches, spastic paralysis, and arm and leg weakness. Cervical spondylosis can resemble neurological disease with unrelated arthritis. It is treated with rest, traction, and possibly a cervical collar. Removal of herniated disks or fusion of vertebrae may be necessary.

cervicitis N.sor-vo-'sI-tosX Inflammation of the cervix of the uterus, caused by infection or irritation. It is most common during the years of menstruation. Cervicitis can be acute or chronic and may worsen during pregnancy. It does not cause pain but may lead to polyps. The major symptom is an abundant discharge, which can impair fertility. Treatment may include antibiotics or cauterization or surgery to repair or remove the cervix; this does not affect fertility.

Cesaire \sa-'zer\, Aime (-Fernand) (b. June 25, 1913, Basse-Pointe, Mart.) Martinican poet and playwright. Educated in Paris, Cesaire returned to Martinique to be elected to the National Assembly as a Communist. A cofounder with Leopold Senghor of the Negritude movement, he ardently supported the decolonization of French colonies of Africa, a view expressed in the fiery poems of Return to My Native Land (1939) and Soleil cou-coupe (1948, “Sun’s Slashed Throat”). Discarding Negritude for black militancy, he turned to the theatre and wrote the political dramas The Tragedy of King Christophe (1963) and A Season in the Congo (1966).

cesarean section \si-'zar-e-3n\ or C-section Surgical removal of a fetus from the uterus through an abdominal incision at or before full term. It is usually performed when vaginal delivery would endanger the life or health of the mother or the child. Vaginal delivery is often possible in subsequent pregnancies. Cesarean section carries the usual risks of major surgery. Once overused, largely for fear of malpractice suits, its use has been greatly reduced by the natural childbirth movement.

cesium Vse-ze-omX Chemical element, one of the alkali metals, chemical symbol Cs, atomic number 55. The first element discovered by spectroscopy (1860), it is silvery white, liquid at warm room temperature (melting at 83 °F [28.4 °C]), and very soft when solid. About half as abundant as lead, it occurs in minute quantities as ores. It reacts explosively with cold water and is used to scavenge traces of oxygen and other gases in electron tubes. Other uses are as a catalyst and in photoelectric cells, ion propulsion systems, atomic clocks, and plasma for thermoelectric conversion. Cesium salts have various specialty applications, including in mineral waters.

Cespedes Vsas-pa-,thas\ (y Borja del Castillo), Carlos Manuel

de (b. April 18, 1819, Bayamo, Cuba — d. March 22?, 1874, San Lorenzo) Cuban revolutionary hero. Bom to a prominent plantation family, he stud-

ied law in Spain. On returning to Cuba, he opened a law practice and secretly organized an independence movement. He launched his insurrection in 1868. Thousands flocked to his rebel army, which scored some stunning victories. He led a revolutionary government, which actively sought annexation by the U.S. Cespedes was deposed in 1873 and went into hiding, but he was discovered and shot by Spanish troops.

cetacean \si-'ta-sh3n\ Any of the exclusively aquatic placental mammals constituting the order Cetacea. They are found in oceans worldwide and in some freshwater environments. Modem cetaceans are grouped in two suborders: about 70 species of toothed whales (Odontoceti) and 13 species of toothless baleen whales (Mysticeti). They have a tapered body, no external hind limbs, and a tail ending in a horizontal blade of two lobes, or flukes. Cetaceans must come to the water’s surface to breathe through blowholes located on top of their head. See also whale.

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Cetsamain See Beltane

Cetshwayo \kech-'wa-yo\ (b. c. 1826, near Eshowe, Zululand [S.Af.] — d. Feb. 8, 1884, Eshowe) Last great king of the Zulus (r. 1 872—79). Nephew of the great Shaka, Cetshwayo commanded a disciplined army of 40,000. Attacked by the British in 1879, he defeated them at Isandhlwana but lost at Ulundi. Part of his kingdom was returned in 1883, but his rivals drove him out of power.

Ceuta Vtha-ii-ta, 'syii-ta \ Arabic Sebta \,seb-to\ Spanish enclave (pop., 2001 : 137,916), North Africa. A military station and seaport, it constitutes with Meulla an autonomous community of Spain with an area of 8 sq mi (20 sq km). The city is on a narrow isthmus that connects Jebel Musa (one of the Pillars of Hercules) to the mainland. Located in northern Morocco at the eastern end of the Strait of Gibraltar, it was successively colonized by Carthaginians, Greeks, and Romans. Long a flourishing trading town, it was taken by the Portuguese in 1415, and it passed to Spain in 1580. In 1995 the Spanish government approved statutes of autonomy for Ceuta.

Ceylon See Sri Lanka

Cezanne \sa-'zan\, Paul (b. Jan. 19, 1839, Aix-en-Provence, France — d. Oct. 22, 1906, Aix-en-Provence) French painter, one of the founders of modem painting. In 1859 he entered law school; in 1861 he left to study art in Paris. Critics denounced the works he exhibited at the Salon des Refuses (1863), but he persevered. He became associated with the Impressionists, exhibiting

with them in 1874 and 1877. Unlike the other artists in the group, he emphasized the structure of objects rather than the vision presented by the light that emanated from them, basing his compositions on cubic masses, patches of colour, and architectonic lines. By the late 1870s he had broken with the Impressionists, exploring his own radically new way of simultaneously depicting deep space and flat design; his later work is therefore often classified as “Post-Impressionist.” From 1890 to 1905 he produced masterpieces, one after another: variations of the Mont Sainte-Victoire landscape, three versions of Boy in a Red Waist-Coat, countless still-life images, and the Bathers series of nudes. Public reception to his first one-man exhibition (1895) was cool, but he slowly gained acceptance. His work was a major source of inspiration for the Cubists Georges Braque and Pablo Picasso. See also Cubism; Impressionism; Post- Impressionism.

CFC See chlorofluorocarbon

CGI in full Common Gateway Interface. Specification by which a Web server passes data between itself and an application program. Typically, a Web user will make a request of the Web server, which in turn passes the request to a CGI application program. The program processes the request and passes the answer to the server, which in turn sends it to the user. The entire interchange follows the rules of the CGI specification, which is actually part of the HTTP protocol. CGI application programs can be written in such programming languages as C++ and Visual Basic, but are usually written in Perl.

Chaadayev V.cho-.o-'da-yofA, Pyotr (Yakovlevich) (b. June 7, 1794, Moscow, Russia — d. April 26, 1856, Moscow) Russian writer. In 1827-31 he wrote in French his Philosophical Letters, which explored among other issues Russia’s relation to the West; he urged a Western path of development for Russia. After a Russian translation of the first letter appeared, it was banned, and Chaadayev was declared insane. He continued to live in Moscow, however, where he was venerated by young Westemizers, whose ideas of Russian history precipitated the debate between Slavophiles and Westernizers.

Chabrier \,sha-bre-'a\, (Alexis-) Emmanuel (b. Jan. 18, 1841, Ambert, Puy-de-Dome, France — d. Sept. 13, 1894, Paris) French composer. Though he was a piano prodigy, his parents obliged him to obtain

Self-Portrait, oil on canvas by Paul Cezanne, c. 1 878-80; in the Neue Pinakothek, Munich, Ger.

THE BRIDGEMAN ART UBRARY/GETTY IMAGES

a law degree and take a government job, but he relinquished the latter in 1880 to pursue composition full-time. His opera Gwendoline enjoyed

several productions in his lifetime, but he never achieved significant success. His other works include nine more operas and operettas, including Le Roi malgre lui (1887), and the orchestral rhapsody Espaha (1883).

Chabrol \sha-'brol\, Claude (b. June 24, 1930, Paris, France) French film director, screenwriter, and producer. After working in public relations in 20th Century-Fox's Paris office, he directed The Cousins (1959), one of the first films of the New Wave movement. Among his many other films are Les Biches (1968), Violette (1978), The Story of Women (1988), and Merci pour la chocolat (2000). He admired Alfred Hitchcock and used a style similar to his in several mystery thrillers, including This Man Must Die (1969), Le Boucher (1970), and La Ceremonie (1995).

Chaco See Gran Chaco

Chaco \'cha-ko\ Culture National Historical Park National preserve, northwestern New Mexico, U.S. Established as a national monument in 1907, it was redesignated and renamed in 1980. Occupying 53 sq mi (137 sq km), it contains 13 major pre-Columbian ruins and more than 300 smaller archaeological sites representing Pueblo cultures. Pueblo Bonito, built in the 10th century, is the largest Pueblo excavated site; it contained some 800 rooms.

Chaco \'cha-ko\ War (1932-35) Conflict between Bolivia and Paraguay over possession of the Chaco, a wilderness region thought to contain oil reserves. Bolivia, landlocked since the War of the Pacific, also was motivated by the need to gain access to the Atlantic coast through the Rio de la Plata system. The war cost about 100,000 lives and so seriously disrupted Bolivia's economy that its deprived masses demanded reform. In a treaty arranged by neighbouring countries and the U.S., Bolivia was given a corridor to the Paraguay River and a port, but Paraguay gained clear title to most of the disputed region.

Chad officially Republic of Chad Country, north-central Africa. Area: 495,755 sq mi (1,284,000 sq km). Population (2005 est.): 9,157,000. Capital: N'Djamena. The Sara are the largest ethnic group, making up about

single ethnic group. Languages: French,

Arabic (both official), Fula, Sara. Religions: Islam, Christianity, traditional beliefs. Currency: CFA franc. The landlocked country's terrain is a shallow basin that rises gradually from the Lake Chad area in the west. The basin is rimmed by mountains, including the volcanic Tibesti Massif

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to the north, rising to 11,204 ft (3,415 m) at Mount Koussi. The lowest

elevation, 573 ft (175 m), is in the Djourab Depression. Chad's river network is limited to the Chari and Logone rivers and their tributaries, which flow from the southeast into Lake Chad. The economy is agricultural; gold, uranium, and petroleum reserves have not been fully exploited. Chad is a republic with one legislative body; its chief of state is the president, its head of government the prime minister. About ad 800 the kingdom of Kanem was founded, and by the early 1200s its borders had expanded to form a new kingdom, Kanem-Bornu, in the north. Its power peaked in the 16th century with its command of the southern terminus of the trans-Sahara trade route to Tripoli. About this time the rival kingdoms of Bagirmi and Ouaddai (Wadai) evolved in the south. In the years 1883-93 all three kingdoms fell to the Sudanese adventurer Rabih al-Zubayr, who was overthrown in 1900 by a local ruler under French protection. Extending their power, the French in 1910 made Chad a part of French Equatorial Africa, and it was made an overseas territory in 1946. The country achieved independence in 1960 but has had decades of civil war despite frequent intervention by France and Libya, resulting in political instability and a lack of economic development.

Chad, Lake Lake, west-central Africa. Located at the juncture of the boundaries of Nigeria, Niger, Chad, and Cameroon, the lake covered 9,900 sq mi (25,600 sq km) in the mid-20th century. Its water level has since dropped — owing to severe drought, the desertification of the surrounding Sahel region, and irrigation projects — and, by the beginning of the 21st century, the lake had shrunk to 580 sq mi (1,500 sq km). The lake is fed by the Chari River.

Chaeronea \ l ker-9- , ne-o\ Ancient city, eastern Greece. Its ruins are located in western Boeotia southeast of Mount Parnassus, near Orchomenus. Philip II of Macedon won the Battle of Chaeronea there in 338 bc. In 86 bc it was the scene of a victory of Sulla over Mithradates VI of Pontus. Plutarch was bom there c. ad 46.

Chaeronea, Battle of (338 bc) Battle in Boeotia, central Greece, in which Philip II of Macedonia defeated Thebes and Athens. The victory, partly credited to Philip's young son Alexander the Great, gave Macedonia a foothold in Greece and represented a start toward Alexander's eventual empire.

Chafee \'cha-fe\, Zechariah, Jr. (b. Dec. 7, 1885, Providence, R.I., U.S. — d. Feb. 8, 1957, Boston, Mass.) U.S. legal scholar. He graduated from Harvard Law School and joined its faculty in 1916. Concerned about the restrictions on freedom of speech imposed in World War I, he wrote Freedom of Speech (1920), which became a leading text of U.S. libertarian thought. Chafee became recognized as an expert on civil liberties (see civil liberty), influencing Louis Brandeis and Oliver Wendell Holmes, Jr. He was also an authority on equity, negotiable instruments, and antitrust law.

chafer Any of several species of scarab beetle (most in the subfamily Melolonthinae). Adult leaf chafers (genus Macrodactylus) eat foliage; the female deposits her eggs in the soil, and the larvae live underground for years, feeding on plant roots. The well-known rose chafer, a tan, long-

legged beetle, feeds on the flowers and foliage of grapes, roses, and other plants. Poultry that eat rose-chafer grubs may be poisoned.

chaffinch Songbird (Fringilla coelebs) that breeds in gardens and farmlands of Europe and northern Africa to central Asia (and, by introduction, South Africa). It is the most common finch in western Europe.

The 6-in. (15-cm) male has a bluish crown, rust-brown back, greenish rump, and pinkish to rust face and breast; the female is greenish brown.

The Canary Islands, or blue, chaffinch (F. teydea) is similar.

Chagall \sha-'gal\, Marc (b. July 7, 1887, Vitebsk, Belorussia, Russian Empire — d. March 28, 1985, Saint-Paul, Alpes-Maritimes, France) Belarusan French painter, printmaker, and designer. After studying painting in St. Petersburg, he moved to Paris in 1910. During the next four years he mixed with the avant-garde there and created what is often considered his best work in the style he would explore for the next 60 years. Often the principal figure in his fantastical works is the painter himself, and memories of Jewish life and folklore in Belarus and themes from the Bible are main sources of imagery. The often whimsical figurative elements in his works are frequently depicted upside down and distributed on the canvas in an arbitrary fashion. In the 1920s he launched a career in printmaking, producing hundreds of etchings for special editions of books. In 1941 he left for New York City, where he designed sets and costumes for Igor Stravinsky’s ballet The Firebird. He later produced stained-glass windows and murals for public buildings in Jerusalem, Paris, and the U.S.

Chagos Archipelago \'cha-gos\ Island group, central Indian Ocean. Located about 1,000 mi (1,600 km) south of the tip of the Indian subcontinent, it has a total area of 23 sq mi (60 sq km). Acquired by Britain from France in 1814, it was originally administered by Britain as a dependency of Mauritius; since 1976 it has been the sole member of the British Indian Ocean Territory. Strategically situated at the centre of the Indian Ocean, its chief island, Diego Garcia, was developed as an air and naval refueling station by the U.S. and Great Britain in the mid 20th century, over the strong opposition from the region’s coastal and island states.

C hag res \'cha-gros\ River River, Panama. Rising in central Panama, it is part of the Panama Canal system and flows southwest where it is dammed to form Gatun Lake. It drains northwest out of the lake and into the Caribbean Sea.

Chaikin \'cha-kon\ / Joseph (b. Sept. 16, 1935, Brooklyn, N.Y., U.S.) U.S. stage director, actor, and writer. He was a member of the Living Theatre before founding the Open Theatre (1963), which became an influential force in experimental theatre. His celebrated productions, the results

of intense collaboration between writer, director, and actors, included America Hurrah (1966), The Serpent (1969), Terminal (1970), The Mutation Show (1971), and Nightwalk (1973). He published his ideas about theatre in The Presence of the Actor (1972). He later collaborated with Sam Shepard on a number of plays, including The War in Heaven (1984) and When the World Was Green (1996). In 1977 he received the first lifetime-achievement Obie Award.

Chain, Sir Ernst Boris (b. June 19, 1906, Berlin, Ger. — d. Aug. 12, 1979, Ire.) German-born British biochemist. With Howard Walter Florey he isolated and purified penicillin and performed the first clinical trials of the antibiotic. For their pioneering work, Chain, Florey, and Alexander Fleming

shared a 1945 Nobel Prize. In addition to his work on antibiotics. Chain studied snake venoms, the spreading factor (an enzyme that aids the dispersal of fluids in tissue), and insulin. He was knighted in 1969.

chain drive Device widely used for the transmission of power where shafts are separated at distances greater than that for which gears are practical. In such cases, sprockets (wheels with teeth shaped to mesh with a chain) take the place of gears and drive one another by means of a chain passing over the sprocket teeth. The chains used in conveyor belts are commonly block chains, and consist of solid or laminated blocks connected by side plates and pins. The blocks engage with teeth on sprocket wheels. Depending on the material being moved, buckets, hooks, or other devices are connected to the blocks.

chain mail or mail Form of body armour worn by European knights and other medieval warriors. An

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early form, made by sewing iron rings to fabric or leather, was worn in late Roman times and may have originated in Asia. Medieval armourers interlaced the rings, which were closed by welding or riveting. In the 8th century, mail was a short coat with a separate sleeve for the sword arm. By the Norman Conquest (1066), the coat was long and fully sleeved; a hood, usually fitting under a helmet, covered the head and neck. By the 12th century, mail was fitted to hands, feet, and legs. The addition of plates to increase chest and back protection gradually evolved in the 14th century into complete plate armour, displacing mail.

chain reaction Process yielding products that initiate further processes of the same kind. Nuclear chain reactions are a series of nuclear fissions initiated by neutrons produced in a preceding fission. A critical mass, large enough to allow more than one fission-produced neutron to be captured, is necessary for the chain reaction to be self-sustaining. Uncontrolled chain reactions, as in an atomic bomb, occur when large numbers of neutrons are present and the reactions multiply very quickly. Nuclear reactors control their reactions through the careful distribution of the fissionable material and insertion of neutron-absorbing materials.

chain silicate See inosilicate

chair Seat, usually with four legs and a back, intended for one person. It is one of the most ancient forms of furniture, dating to the 3rd Egyptian dynasty (c. 2650-2575 bc). Various styles were developed throughout Europe. In the 16th century, many chairs began to be covered with upholstery over padding and decorated with elaborate wood carving. U.S. chairs adapted versions of English styles from the late 17th century.

Chajang Yulsa Vja-'yaq-'yul-'saV (fl. 7th century, Korea) Korean Buddhist monk who attempted to make Buddhism the state religion. He went to Tang-dynasty China in 636 for seven years of study and practice and returned with some of the supposed remains of the historical Buddha. Appointed to the highest Buddhist post in Silla, he erected a tower to house the remains and asserted Silla’ s leadership over the other kingdoms of Korea. He sought China’s aid in wars against them. He built the Tongdo Temple to uphold monastic austerity as a model for the nation and sought to make Buddhism a unifying force in Korean society.

chakra Vcha-kroN In Hinduism and Tantra, any of 88,000 focal points in the human body where psychic forces and bodily functions can merge and interact. In Hinduism there are seven and in Tantra four major chakras, each associated with a colour, shape, sense organ, natural element, deity, and mantra. The most important are the heart chakra, the chakra at the base of the spine, and the chakra at the top of the head.

chakravartin or cakravartin N.cho-kro-'var-UnV Ancient Indian conception of the world ruler. Buddhist and Jain sources distinguish three types of secular chakravartin s: cakravala cakravartin, ruler over all four of the continents of Indian cosmography; dvipa cakravartin, ruler of one continent; and pradesa cakravartin, a ruler of part of a continent. The chakravartin was considered a secular counterpart to a buddha.

Chakri dynasty Thailand’s ruling family. Phraphutthayotfa Chulalok (1737-1809) founded the dynasty and ruled as Rama I (r. 1782-1809).

He reorganized Siam’s defenses to successfully repel numerous Burmese attacks. His descendants have reigned in an unbroken line ever since. Rama III (r. 1824-51) increased trade with Europe and negotiated a treaty with the British East India Co.; King Mongkut (Rama IV; r. 185 1-68) and King Chulalongkorn (Rama V; r. 1 868—1910) helped modernize the government along Western lines and thereby avoided colonial rule. King Vajiravudh (Rama VI; r. 1910-25) instituted social reforms and restored the nation’s fiscal autonomy (lost to the West under Rama IV). Bhumibol Adulyadej (Rama IX) has reigned since 1946 as Thailand’s ceremonial head of state.

Chalcedon Vkal-so-.danV, Council of (451) Fourth ecumenical council of the Christian Church, held in Chalcedon (modern Kadikoy, Tur.). Called by the emperor Marcian, it approved the creeds of Nicaea (325) and Constantinople (381; later known as the Nicene Creed). It also approved the Tome of Pope Leo I confirming the two distinct natures in Christ and rejecting the Monophysite heresy. The council then explained these doctrines in its own confession of faith. The council disciplined clergy and declared Jerusalem and Constantinople patriarchates.

chalcedony or calcedony \kal-'se-d 3 n-e\ Very fine-grained variety of the silica mineral quartz. A form of chert, it occurs in a great variety of colours, usually bluish white, gray, yellow, or brown. Other physical

properties are those of quartz. For centuries, chalcedony has been the stone most used by gem engravers, and many varieties are still cut and polished as ornamental stones. See also agate; carnelian; onyx.

Chalcis See Chalkis

chalcocite Vkal-ko-.shA Sulfide mineral, Cu 2 S, that may be an important ore of copper. It belongs to a group of sulfide minerals formed at relatively low temperatures. Chalcocite alters to native copper and other copper minerals. Valuable deposits occur in Nevada and Arizona, where other components of the original rock have been dissolved away; chalcocite is also found with bornite in sulfide veins in Montana and Namibia.

chalcopyrite^kal-ko-'pI-.rfiAMost common copper mineral, a copper and iron sulfide (CuFeS 2), and a very important copper ore. It typically occurs in ore veins deposited at medium and high temperatures, as in parts of Spain, Japan, Montana, and Missouri. Chalcopyrite is a member of a group of sulfide minerals, and it crystallizes in the tetragonal crystal system. Its atomic structure is related to that of SPHALERITE.

Chaldea \kal-'de-o\ Ancient region, on the headwaters of the Euphrates River and adjacent to the Persian Gulf. It was originally the southern part of Babylonia; the name Chaldea also has been used (especially in the Bible) to describe all of Babylonia after it was occupied by the Chaldeans, who established a Chaldean (or neo-Babylonian) dynasty c. 625 bc. Under Nebuchadrezzar II, the empire expanded, subduing Judaea and capturing

Jerusalem. It fell to the Persian Achaemenian dynasty in 539 bc.

Chaleur \sha-'loer\ Bay Inlet of the Gulf of St. Lawrence, southeastern Canada. It extends about 90 mi (145 km) between northern New Brunswick and the Gaspe Peninsula. It receives many rivers, including the Restigouche. The bay is famous as a fishing ground, especially for mackerel. It was navigated and named in July 1534 by Jacques Cartier.

Chalgrin \shal-'gra n \, Jean-Francois-Therese (b. 1739,, Paris, Fr. — d. Jan. 21, 1811, Paris) French architect. He was trained by Etienne-Louis Boullee and won the Academy of Architecture's Grand Prix de Rome at age 19. His Saint-Philippe-du-Roule (1764), Paris, was influential in reviving the basilica plan as a standard for European churches; it is characterized by a simplicity of design in stark contrast to the complex interiors of existing Gothic and Renaissance churches of the time. Chalgrin died before finishing his masterpiece, the Arc de Triomphe.

Chaliapin Vsho-'lya-pinV Feodor (Ivanovich) or Fyodor Shalyapin (b. Feb. 13, 1873, near Kazan, Russia — d. April 12, 1938, Paris, France) Russian singer. Born a peasant, he received little early musical training, but his talent led to his taking leading roles with a touring opera company in his teens. Coached by Dimitri Usatov (1847-1913), he had debuts in St. Petersburg (1894) and Moscow (1896), where he played Boris Godunov, the role he would be most associated with. These led to his triumphant 1901 La Scala debut as Mefistofele. His imposing stage presence and fine acting gave him a popularity second only to that of Enrico Caruso.

chalk Soft, fine-grained, easily pulverized, white-to-grayish variety of limestone, composed of the shells of minute marine organisms. The purest varieties contain up to 99% calcium carbonate in the form of the mineral calcite. Extensive deposits occur in western Europe south of Sweden and in England, notably in the chalk cliffs of Dover along the English Channel. Other extensive deposits occur in the U.S. from South Dakota to Texas and eastward to Alabama. Chalk is used for making lime and Portland cement and as a soil additive. Finely ground and purified chalk is known as whiting and is used as a filler, extender, or pigment in a wide variety of materials, including ceramics, putty, cosmetics, crayons, plastics, rubber, paper, paints, and linoleum. The chalk commonly used in classrooms is a manufactured substance rather than natural chalk.

Chalkis also called Khalkis \kal-'kes\ or Chalcis \'ka\-s3s\ formerly Euripus \'e-vre-pos\ City (pop., 2001: 53,584), on the island of Euboea, Greece. It is situated off the Euripus Strait, which separates Euboea from the Greek mainland. The city was important as a commercial centre as

Chalcocite from Bristol, Conn.

EMIL JAVORSKY

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early as the 7th century bc. It established colonies in Macedonia, Italy, and Sicily and was a base for campaigns against Athens until 411 bc. Aristotle died in Chalcis in 322 bc. The city became part of Greece in 1830.

chalybite See siderite

Chambal River Ychsm-boA River, northern India. Rising in the western Vindhya Mountains near Indore, it flows easterly 550 mi (900 km) before emptying into the Yamuna River, of which it is the chief tributary, west of Kanpur.

chamber music Music composed for small instrumental ensembles and performed without a conductor. Traditionally intended for performance in a room or reception hall, often solely for the performers' own pleasure, chamber music is now often heard in concert halls. It began with the 16th-century instrumental consort, and long continued to be associated with aristocratic households. The duo sonata (usually for violin and continuo) and trio sonata appeared in early 17th-century Italy. The string quartet arose in the 1750s and remains the best-known chamber genre and ensemble. The serenade, nocturne, and divertimento were Classical genres for varying instrumental forces, often intended to accompany meals and other activities. Standard ensembles include the string trio (violin, viola, cello), string quintet (two violins, two violas, cello), and piano trio (piano, violin, cello). The chamber orchestra, usually with fewer than 25 musicians, is often used for 18th-century music and usually requires a conductor. See also sonata.

chamber of commerce or commercial association Any of

various voluntary organizations of business firms, public officials, professional people, and public-spirited citizens whose primary interest is in publicizing, promoting, and developing commercial and industrial opportunities in their local area, and usually also community schools, streets, housing, and public works. The International Chamber of Commerce (founded 1920) acts as the voice of the business community in the international field and runs a court of arbitration for settling commercial disputes. National chambers of commerce exist in most industrialized, free-enterprise countries. The first to use the name was founded in Paris in 1601; the first U.S. chamber of commerce was that of the state of New York, founded in 1768.

Chamberlain Ycham-bor-lanV, Sir (Joseph) Austen (b. Oct. 16, 1863, Birmingham, Warwickshire, Eng. — d. March 16, 1937, London) British statesman. Son of Joseph Chamberlain and half brother of Neville Chamberlain, he entered the House of Commons in 1892. He held a variety of posts, including chancellor of the Exchequer (1903-05, 1919-21) and secretary of state for India (1915-17). As foreign secretary (1924-29), he helped bring about the Locarno Pact, intended to secure peace in western Europe. For that accomplishment, he shared the 1925 Nobel Prize for Peace with Charles Dawes.

Chamberlain, Charles Joseph (b. Feb. 23, 1863, Sullivan, Ohio, U.S.— d. Feb. 5, 1943, Chicago, 111.)

U.S. botanist. His research into the

structure and life cycles of primitive plants (cycads) enabled him to suggest a course of evolutionary development for the egg and embryo of seed plants (spermatophytes) and to speculate about a cycad origin for flowering plants (angiosperms). He organized and directed the botanical laboratories at the University of Chicago (1897-1931), where, with plants collected in Mexico, Australia, New Zealand, South Africa, and Cuba, he created the world's foremost collection of living cycads.

Chamberlain, Houston Stewart (b. Sept. 9, 1855, Southsea,

Hampshire, Eng. — d. Jan. 9, 1927,

Bayreuth, Ger.) British-born Germanophile writer. An admirer of Richard Wagner, he wrote a biography of the composer and several books on his works (1892-95) and later married Wagner's daughter. In his Foundations of the Nineteenth Century (2 vol., 1899), he presented a broad but biased analysis of European culture and proclaimed the racial and cultural superiority of the so-called Aryan

element in European culture. His theories, which owed much to the writings of Joseph Arthur, count de Gobineau, influenced German nationalist thought, particularly Adolf Hitler's National Socialist movement.

Chamberlain Ycham-bsr-lhA, John (Angus) (b. April 16, 1927, Rochester, Ind., U.S.) U.S. sculptor. He studied at the School of the Art Institute of Chicago and at Black Mountain College. In 1957 he had his first one-man exhibition in Chicago. His Abstract Expressionist sculptures are often constructed of fragments of automobiles, crushed and jammed together, and painted in bright, industrial colours; these produce an effect of isolated, frozen movement. He also exhibited paintings, prints, and films.

Chamberlain, Joseph (b. July 8, 1836, London, Eng. — d. July 2, 1914, London) British politician and reformer. Early success in business enabled him to retire at age 38 with a substantial fortune. He was elected to Parliament (1876-1906), where he became a leader of the left wing of the Liberal Party. In 1886, in opposition to Irish Home Rule, he joined other dissident Liberals (Liberal Unionists) to defeat the Liberal government. He used his control of the Liberal Unionists to pressure the subsequent Conservative government to adopt a more progressive social policy. As colonial secretary (1895-1903), he advocated tax reform and a federated empire of

self-governing colonies, helping pass the Commonwealth of Australia bill (1900). He resigned when his proposals for a tariff giving preference to imperial products were rebuffed by the government.

Chamberlain, (Arthur) Neville (b. March 18, 1869, Birmingham, Warwickshire, Eng. — d. Nov. 9, 1940, Heckfield, near Reading, Hampshire) British prime minister (1937-40). Son of Joseph Chamberlain and half brother of Austen Chamberlain, he prospered in the metalworking industry in Birmingham; as the city's lord mayor (1915-16) he organized England's first municipal bank. He was a member of the House of Commons (1918 — 40), during which he served in Conservative governments as minister of health and chancellor of the Exchequer. As prime minister (1937-40), he sought to prevent the outbreak of a general European war over Adolf Hitler's demand that Czechoslovakia cede the Sudetenland to Germany. In 1938 he and France's Edouard Daladier granted most of Hitler's demands in the Munich agreement, after which he returned to England a popular hero, speaking of "peace in our time." He repudiated appeasement after Hitler seized the rest of Czechoslovakia, and when Germany attacked Poland, he declared war. He lost the support of many Conservatives after the failure of a British expedition to Norway and resigned in 1940.

Chamberlain, Wilt(on Norman) (b. Aug. 21, 1936, Philadelphia, Pa., U.S. — d. Oct. 12, 1999, Los Angeles, Calif.) U.S. basketball player, one of the greatest offensive players in basketball history. The 7-ft 1-in. (2.16-m) Chamberlain played two years (1956-58) for the University of Kansas. "Wilt the Stilt" later played centre for the Philadelphia (later Golden State) Warriors (1959-65), the Philadelphia 76ers (1965-68), and the Los Angeles Lakers (1968-73). In the 1961-62 season he became the first player to score more than 4,000 points in regular-season NBA games, including a record 100 points in a single game (1962). He led the NBA in scoring seven consecutive years (1959-65) and in rebounding 1 1 times. He ranks first in career rebounds (23,924) and career rebounding average (22.9 per game).

Chamberlain's Men or Lord Chamberlain's Men English theatrical company, the most important in Elizabethan and Jacobean England. It was based at the Globe Theatre from 1599 to 1608. In 1603 it was taken under royal patronage as the King's Men. William Shakespeare was connected with the company for most of his career; it also presented works by Ben Jonson, Thomas Dekker, and Francis Beaumont and John Fletcher. It ceased to exist when the theatres were closed at the outbreak of the English Civil Wars in 1642.

Charles Chamberlain, 1 925

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Joseph Chamberlain, detail of an oil

painting by Frank Holl, 1 886; in the
National Portrait Gallery, London

COURTESY OF THE NATIONAL PORTRAIT GALLERY,
LONDON

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Chamberlen, Hugh (b. 1630, London, Eng. — d. c. 1720, London)
British midwife. He was grandnephew of Peter Chamberlen the Elder (1560-1631), who invented the obstetrical forceps. A midwife to Catherine, queen of Charles II of England, Hugh Chamberlen used his position to exploit his use of the forceps, previously a family secret, and referred to them in the preface to his translation of a French treatise on midwifery, a standard in obstetrics for 75 years. Near the end of his life, he sold his secret to a Dutch surgeon.

Chambers, Robert and William (respectively b. July 10, 1802, Peebles, Tweeddale, Scot. — d. March 17, 1871, St. Andrews, Fifeshire; b. 1800, Peebles — d. 1883) Scottish publishers. Robert, who began business as a bookstall keeper in Edinburgh, wrote historical, literary, and geological works. In 1832 the brothers started Chambers's Edinburgh Journal, which led to the establishment of the publishing firm W. & R. Chambers, Ltd. Their Chambers's Encyclopaedia (1859-68) was based on a translation of the German Konversations-Lexilcon. Considered scholarly and reliable on historical subjects, the encyclopaedia has gone through several editions, but the lack of a continuous revision system has led to the dating of much of its material.

Chambers, (David) Whittaker orig. Jay Vivian Chambers (b.

April 1, 1901, Philadelphia — d. July 9, 1961, near Westminster, Md., U.S.)
U.S. journalist and principal figure in the Alger Hiss case. He joined the Communist Party in 1923 and worked at various times as an editor at New Masses, The Daily Worker, and Time magazine. In testimony before the House Un-American Activities Committee in August 1948, he named former State Department official Alger Hiss as a fellow member of a 1930s Communist spy ring. Hiss denied the charges and sued Chambers for slander. In the trials that followed. Chambers produced material he claimed Hiss had given him to pass along to Soviet agents. His autobiography, Witness, was published in 1952.

Chambord \sha n -'bor\, Henri Dieudonne d'Artois, count de

(b. Sept. 29, 1820, Paris, France — d. Aug. 24, 1883, Frohsdorf, Austria)
French nobleman, last heir of the elder branch of the house of Bourbon and, as Henry V, pretender to the French throne from 1830. Son of the duke de Berry, he was forced to flee France in 1830 when his grandfather, Charles X, abdicated and Louis-Philippe seized the throne. In 1870, after the fall of Napoleon III, Chambord invited France to reunite under the

Bourbons. For a time the restoration of the monarchy seemed possible, but Chambord’ s hostility toward the principles of the French Revolution undermined his support.

chameleon Any member of a group of Old World, primarily tree-dwelling lizards in the family Chamaeleontidae, characterized chiefly by their ability to change body colour. Other traits include toes fused into opposite bundles of two and three, teeth attached to the jaw edge, and a long, slender, extensile tongue. About half of the 89 species are found only in Madagascar; the others live mostly in sub-Saharan Africa. A few are found elsewhere. Most are 7-10 in. (17-25 cm) long, with a body flattened from side to side. The bulged eyes move independently. Each species can undergo a particular range of colour change. Insects are the main diet, but larger species also eat birds.

chamomile Vka-mo-.mlL Any of the more than 100 species of Eurasian herbs that make up the genus Anthemis, in the composite family; also, a similar plant in the genus Chamaemelum of the same family.

Both genera have yellow or white ray flowers and yellow disk flowers.

Several Anthemis species are cultivated as ornamentals, especially golden marguerite, or yellow chamomile (A. tinctoria). The strong-smelling mayweed (A . cotula) has been used in medicines and insecticides. Chamomile tea, used as a tonic and an antiseptic as well as in herbal remedies, is made from C. nobile, or A. nobilis.

Chamorro \cha-'mor-ro\, Violeta (Barrios de) (b. Oct. 18, 1929, Rivas province, Nic.) President of Nicaragua (1990-96). Bom into a wealthy family, she married the publisher of La Prensa, a newspaper that opposed the Anastasio Somoza dictatorship (see Somoza family). After her husband was assassinated in 1978, she took his place as publisher. When the Sandinistas overthrew Somoza, she served briefly on a ruling civilian junta, but her newspaper soon became critical of Daniel Ortega and supportive of U.S. policies, which included extensive support for the anti-Sandinista contras. Advocating an end to military and economic conflicts with the U.S., she was elected president in 1990. Her presidency was troubled by continuing deep political divisions and the significant power still held by the Sandinistas.

Chamoun \sham-'un\, Camille (Nimer) also spelled Kamil Sham'un (b. April 3, 1900, Dayr al-Qamar, Leb. — d. Aug. 7, 1987, Beirut) President of Lebanon (1952-58). He reorganized government departments to increase efficiency and allowed the press and opposition groups considerable freedom. International tensions rose in 1956 when he refused to break relations with Britain and France over the Suez Crisis. In 1958, when Syria and Egypt formed the short-lived United Arab Republic, he refused pleas from Lebanon’s Muslims to join. Armed rebellion

broke out, and Chamoun did not seek a second presidential term. He held ministerial posts during the Lebanese civil war (1975–91).

Champa Ancient kingdom, Southeast Asia. Occupying a region now part of central Vietnam, it was formed in the 2nd century ad during the breakup of China's Han dynasty when the Han official in charge of the region established his own kingdom around present-day Hue. Coming under Indian cultural influence, it withstood over the next several centuries attacks from China, Java, Vietnam, and the Khmer empire. By the late 15th century, incessant wars had led to its demise.

Champagne \sham-'pan\ Historical and cultural region, northeastern France. The terrain is interrupted by low hills and by the Marne River valley. It was an important medieval French county held by the houses of Vernandois, Blois, and Navarra. In the 12th and 13th centuries it was the site of six great trade fairs and was a banking centre for all of Europe. Conflicts between the counts of Champagne and the kings of France ended with the marriage (1286) of Joan of Navarra and Champagne to King Philip IV of France, and Champagne was united with the French crown in 1314. As a frontier region, it was frequently invaded; it was the site of fierce battles in World Wars I and II. The region is famous for its wines.

champagne Sparkling wine. Named for the site of its origin, the Champagne region of northeastern France, it is made from only three grapes: pinot and meunier (both black) and chardonnay (white). The juice from these grapes is initially fermented in stainless-steel vats. A mixture of wine, sugar, and yeast is added, and it is then transferred to pressure tanks for a second fermentation that yields carbon dioxide and effervescence. It is chilled, sweetened, bottled, and left to mature. It generally has a crisp, flinty taste that varies in degree of sweetness, depending on the type.

Champaigne \sha n -'pan y \, Philippe de (b. May 26, 1602, Brussels — d. Aug. 12, 1674, Paris, Fr.) Flemish-born French painter. Trained in Brussels, he arrived in Paris in 1621. His patrons included Louis XIII, Marie de Medicis, and Cardinal Richelieu, and he became the outstanding French portraitist of the Baroque period. He became a professor at the Royal Academy (1653) and produced many pieces for the palaces and churches of Paris. His finest work includes two portraits of Richelieu and various paintings for the Jansenist Convent of Port-Royal, especially the austere Ex-voto: Mother Agnes and Sister Catherine (1662), commemorating his daughter Catherine's miraculous cure through Mother Agnes's prayers.

Champlain Xsham-'planV Lake Lake between Vermont and New York, U.S. Located on the states' northern boundaries and extending into Canada about 6 mi (10 km), it is about 125 mi (200 km) long and has an area of 430 sq mi (1,115 sq km). It was visited in 1609 by Samuel de Champlain. In 1776 it was the scene of the first British- American naval battle and in 1814 of a U.S. naval victory over the British. A link in the waterway between New York City's harbour and the lower St. Lawrence River, it is used extensively for commercial and pleasure-boat navigation.

Champlain, Samuel de (b. 1567, Brouage, France — d. Dec. 25, 1635, Quebec, New France) French explorer. He made several expeditions to North America before founding Quebec in 1608 with 32 colonists, most of whom did not survive the first winter. He joined with the northern Indian tribes to defeat Iroquois marauders and promoted the fur trade with the Indians. He discovered Lake Champlain in 1609 and made other

explorations of what are now northern New York, the Ottawa River, and the eastern Great Lakes. English privateers besieged Quebec in 1628,

Chamomile (Anthemis tomentosa)

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when England and France were at war, and he was taken prisoner. In 1632 the colony was restored to France, and in 1633 Champlain made his last voyage to Quebec, where he lived until his death.

champleve \shau-l3-'va\ Decorative enameling technique. The process consists of cutting away cells or troughs in a metal plate and filling the depressions with pulverized vitreous enamel. The raised metal lines between the cut-out areas form the design outline. Champleve was practiced in the Celtic areas of western Europe in the Roman period. It flourished in the Rhine Valley near Cologne and in Belgium in the 1 1th—

12th century. The most notable enamelers were Nicholas of Verdun and Godefroid de Claire.

Champollion \sha n -p6l-'yo n \,

Jean-Francois (b. Dec. 23, 1790,

Figeac, France — d. March 4, 1832,

Paris) French scholar. He played a major role in the deciphering of Egyptian hieroglyphs. Champollion was a linguistic prodigy who had immersed himself in Hebrew, Arabic, Syriac, and Coptic as well as Greek and Latin by age 19. After study of the Rosetta Stone and other texts, Champollion demonstrated decisively in Summary of the Hieroglyphic System of the Ancient Egyptians (1825) that a phonetic value could be assigned to some hieroglyphs. He became curator of the Louvre's Egyptian collection (1826) and conducted an archaeological expedition to Egypt (1828-30). See also Egyptian language.

Champs-Elysees \'shau-za-le-'za\ (French: "Elysian Fields") One of the world's most remarkable avenues, stretching 1.17 mi (1.88 km) from the Arc de Triomphe to the Place de la Concorde, in Paris. It is divided into

two parts by the Rond-Point des Champs-Elysees. The lower part, toward the Place de la Concorde, is surrounded by gardens, museums, theaters, and restaurants. The upper part, toward the Arc de Triomphe, was traditionally a luxury commercial district. Twelve imposing avenues radiate to form a star (etoile) at the avenue’s upper end, with the Arc de Triomphe at its center; it was called Place de 1’ Etoile from 1753 until 1970, when it was renamed Place Charles de Gaulle.

Detail of a champleve crucifix by Godefroid de Claire, 1 2th century; in the British Museum

COURTESY OF THE TRUSTEES OF THE BRITISH MUSEUM

Chan Chan \'chan-'chan\ Ancient city, northern Peru. Located 300 mi (480 km) north of modem-day Lima, it was the capital of the Chimu, a pre-Incan civilization that flourished c. 1200-c. 1400. The ruins, which cover nearly 14 sq mi (36 sq km), consist of walled citadels containing temples, cemeteries, and gardens.

The successors of the Moche civilization, the Chimu came under the rule of the Incas c. 1465-70.

chancellor In western Europe, the title of holders of numerous offices of varying importance, ultimately political in nature. The prime ministers of Germany and Austria are called chancellors. In Britain the chancellor

of the Exchequer is the cabinet member in charge of finance. In the U.S. the title is used mainly for the chief administrators of universities.

Death mask of gold and silver alloy with copper eyes and ears, Chimu culture, c. 1 000-c. 1 465, centred at Chan Chan; in a private collection

FERDINAND ANTON

Chancellorsville, Battle of Military engagement of the American Civil War. In May 1863 near Chancellorsville, Va., the Union army in Virginia, led by Joseph Hooker, attempted to encircle and destroy the Confederate Army of Northern Virginia, led by Robert E. Lee. The Union army was surprised by a flanking force under the command of Stonewall Jackson. Three days of fighting ended in a Union retreat north of the Rappahannock River. The Union army lost more than 17,000 men in a force of

130,000; the Confederate army lost more than 12,000, including Jackson, in a force of 60,000.

chancery Vchan-s9-re\ Court of public record and archive of state documents. The chancery system of the Roman Empire served as the model

for the royal chanceries of medieval France and Germany. Medieval royal chanceries were headed by archchancellors and chancellors, who oversaw the work of scribes and notaries and sometimes served as advisers to the monarch.

Chancery, Court of See equity, chancellor

chancre Vshaq-korV Primary sore or ulcer at the site of entry of a pathogen; specifically, the typical skin lesion of primary infectious syphilis. In women it is often internal and may go unnoticed. This single red papule (bump), usually occurring about three weeks after infection, and painless regional lymph-node swelling are the major signs of early-stage syphilis. Identification of Treponema pallidum in its fluid makes the diagnosis. The chancre heals in two to six weeks, but syphilis progresses unless treated With PENICILLIN.

Chandigarh Vchon-de-gorX City (pop., 2001 prelim.: 808,796) and union territory (pop., 2001 prelim.: 900,914), joint capital of Haryana and Punjab states, northern India. The territory, on the border between the two states, has an area of 44 sq mi (114 sq km). Located just south of the Shiwalik Hills, the site was selected to replace the former capital of Lahore, which became part of Pakistan at partition in 1947. The city was laid out in the 1950s by Le Corbusier in collaboration with Indian architects. Today it is a major communications junction.

Chandler, Raymond (Thornton) (b. July 23, 1888, Chicago, 111., U.S. — d. March 26, 1959, La Jolla, Calif.) U.S. writer of detective fiction. Chandler worked as an oil-company executive in California before turning to writing during the Great Depression. Early short stories were followed by screenplays, including Double Indemnity (1944), The Blue Dahlia (1946), and Strangers on a Train (1951). His character Philip Marlowe, a hard-boiled private detective working in the Los Angeles underworld, appears in all seven of his novels, including The Big Sleep (1939; film, 1946 and 1978), Farewell, My Lovely (1940; film Murder, My Sweet, 1944, and Farewell, My Lovely, 1975), and The Long Good-Bye (1953; film, 1973). Chandler and Dashiell Hammett are regarded as the classic authors of the hard-boiled genre.

Chandra Gupta II or Candra Gupta II or Vikramaditya (fl. 4th-5th centuries ad, India) Powerful emperor (r. c. 380-c. 415) of the Gupta dynasty of northern India. A grandson of Chandra Gupta I (r. 320-c. 335), who founded the dynasty, he is thought to have achieved power by assassinating a weak elder brother. He inherited a large empire and extended control over neighbouring territories through battle and marriage alliances. Under him, India enjoyed peace and relative prosperity. His system of government and his charity were admired by the Chinese pilgrim Faxian. He was a patron of the poet Kalidasa. Though a devout Hindu, he tolerated the Buddhist and Jain religions.

Chandragupta Maurya or Candra Gupta \ l kon-dr3- l gup-t3\

Maurya (fl. 4th– 3rd centuries bc, India) Founder of the Maurya dynasty and the first emperor (r. c. 321-c. 297 bc) to unify most of India under one administration (see Mauryan empire). Born to a destitute migrant Mauryan family, he was sold into slavery and eventually purchased by a Brahman politician, who gave him an education in military tactics and the arts. Chandragupta gathered mercenary soldiers, secured public support, overthrew the Nanda dynasty, and established his own in modern-day Bihar. On the death of Alexander the Great (323 bc), he won control of the Punjab (c. 322). He expanded his empire east to the borders of Persia, south to India's tip, and north to the Himalayas and the Kabul River valley. His administration was patterned on that of the Persian Achaemenian dynasty. He died fasting in sympathy for his people during a time of famine.

Chandrasekhar X.chon-dro-'sha-karX, Subrahmanyan (b. Oct. 19, 1910, Lahore, India– -d. Aug. 21, 1995, Chicago, 111., U.S.) Indian-born U.S. astrophysicist. He left the University of Cambridge to join the staff of the University of Chicago in 1938. He determined that, following its red giant phase, a star with a remaining mass greater than 1.4 times that of the Sun (the Chandrasekhar limit) collapses and becomes a neutron star during a supernova explosion. Stellar remnants more massive than about three solar masses collapse even further to become black holes. He shared a 1983 Nobel Prize with William A. Fowler.

Chanel \sha-'nel\, Gabrielle known as Coco Chanel (b. Aug. 19, 1883, Saumur, France – d. Jan. 10, 1971, Paris) French fashion designer. Little is known of her early life. In 1913 she opened a millinery shop in Deauville, and within five years her innovative use of jersey fabric and accessories was attracting wealthy patrons. Her nonconformist designs.

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stressing simplicity and comfort, revolutionized the fashion industry for the next 30 years. She popularized turtleneck sweaters, the "little black dress," and the much-copied "Chanel suit." Chanel industries included a Parisian fashion house, a textile business, perfume laboratories, and a workshop for costume jewelry. The financial basis of her empire was Chanel No. 5 perfume, introduced in 1922 and still popular.

Chaney, Lon in full Alonso Chaney (b. April 1, 1883, Colorado Springs, Colo., U.S. – d. Aug. 26,

1930, Los Angeles, Calif.) U.S. film actor. Bom to deaf-mute parents, he learned pantomime and became an actor at 17. He moved to Hollywood in 1912 and played supporting roles until The Miracle Man (1919) made him a star. Known as "the man of a thousand faces," he was famous for his ability to transform himself

through the use of makeup. He often played grotesque or dual characters in films directed by Tod Browning, including The Unholy Three (1925).

His other silent films include The Hunchback of Notre Dame (1923),

The Phantom of the Opera (1925), and London After Midnight (1927).

His son Lon Chaney, Jr. (1905-73), appeared in numerous horror films in such repeated roles as the Wolf Man and the Mummy and, notably, in Of Mice and Men (1939).

Chang Chih-tung See Zhang Zhidong
Chang Chu-cheng See Zhang Juzheng
Chang Jiang See Yangtze River
Chang Tao-Ling See Zhang Daoling
Chang Tsai See Zhang Zai
Chang Tso-lin See Zhang Zuolin

Chang'an Vchaq-'anX or Ch'ang-an Ancient capital of China during the Han, Sui, and Tang dynasties, near present-day Xi'an. From the mid-4th century it was a centre of Buddhist studies. Wendi, first emperor of the Sui, expanded Chang'an: its outer walls were 6 mi (9.7 km) by 5 mi (8.2 km), with 14 avenues running north-south and 11 running east-west. The centre of the northern boundary was the site of the imperial palace; in front of it was an administrative compound 3 mi (4.5 km) square. Until the proscription of foreign religions in the 840s, Chang'an contained numerous Buddhist temples, along with Nestorian, Manichaean, and Zoroastrian churches and many Daoist monasteries. It was reduced to ruins in the 880s by the rebel Huang Zhao, and future dynasties established their capitals elsewhere.

Changchun or Ch'ang-ch'un \'chaq-'chun\ City (pop., 1999 est.: 2,072,324), capital of Jiun province, northeastern China. It was a small village until the end of the 18th century, when farmers from Shandong began to settle near the Sungari River. It gained in importance after the completion of the Chinese Eastern Railway. It came under Japanese control following the Sino- Japanese War of 1894-95. At the time the Japanese seized Manchuria in 1931, the capital of the Japanese puppet state of Manchukuo was moved from Mukden (Shenyang) to Changchun. Following World War II, the city suffered severely in the fighting between communist and Nationalist forces but experienced phenomenal growth under Chinese communist rule. It is now a centre for industrial expansion, as well as the cultural and educational heart of the province.

Changchun See Qiu Chuji

change ringing Traditional English art of ringing tower or hand bells in a succession of different orders. Groups of swinging bells in English church towers date from the 10th century. Control of bell ringing was much enhanced with the invention of the bell wheel in the 14th century; further improvements in bearings and fittings allowed the bells to swing at the same speed and led to recognizably modern change ringing by the

17th century. A “ring” (set) of 6 bells can be tolled in 720 different

“changes” (orders); 8 bells allow 40,320 different changes, and 10 bells allow more than 3,000,000. In practice, only a selection of the possible changes is rung, derived by a “method” (a shuffling algorithm), usually involving switching pairs of bells in a certain order (e.g., 123456 becomes 214365, which can then become 241635, etc.). “Rounds” — all the bells in order from highest to lowest — is rung before and after a method is completed.

Changsha \'chaq-'sha\ or Ch'ang-sha City (pop., 2003 est.: 1,562,200), capital of Hunan province, south-central China. It was important from the time of the Qin dynasty (221-207 bc). In ad 750-1100 Changsha was an important commercial city, and its population increased greatly. Under the Qing dynasty, from 1664, it was the capital of Hunan province, and it was a major rice market. It was besieged during the Taping Rebellion but never fell. Changsha was the site of Mao Zedong’s conversion to communism. It was the scene of major battles in the Sino-Japanese War of 1937-45 and was briefly occupied by the Japanese. Rebuilt since 1949, the city is now a major port and a commercial and industrial centre.

Channel, The See English Channel

Channel Islands or Santa Barbara Islands Chain of islands, southern California, U.S. Extending 150 mi (240 km) along and 12-70 mi (20-115 km) off the coast, it is divided into the Santa Barbara group (San Miguel, Santa Rosa, Santa Cruz, and Anacapa) and the Santa Catalina group (Santa Barbara, San Nicolas, Santa Catalina, and San Clemente). The islands range in size from Santa Cruz (98 sq mi [254 sq km]) to the small Anacapa islets. Rugged and mountainous, they are frequented by colonies of sea lions, seals, and birds and are noted for their distinctive plant life (several hundred varieties). The larger islands support sheep and cattle ranches, and Santa Catalina is a noted resort. Channel Islands National Park (established as a national monument in 1938) embraces Anacapa, San Miguel, Santa Barbara, Santa Cruz, and Santa Rosa.

Channel Islands Island dependencies, United Kingdom. Located in the English Channel 10-30 mi (16-48 km) off the western coast of France, they cover an area of 75 sq mi (194 sq km) and include the islands of Jersey, Guernsey, Alderney, and Sark and several islets. They are domestically independent of the British government. Structures, including menhirs, are evidence of prehistoric occupation. A part of Normandy in the 10th century ad, the islands came under British rule at the time of the Norman Conquest in 1066. The islets of Ecrehous and Les Minquiers were disputed between England and France until 1953, when the International Court of Justice confirmed British sovereignty. The dispute revived in the late 20th century because sovereignty determines the rights to the continental shelf’s economic development (especially petroleum). The Channel Islands were the only British territory occupied by Germany in World War II. The islands are famous for their cattle breeds, including the Jersey and Guernsey.

Channel Tunnel or Eurotunnel Rail tunnel that runs beneath the English Channel between Folkestone, England, and Sangatte (near Calais), France. A rail tunnel was chosen over proposals for a very long suspension bridge, a bridge-and-tunnel link, and a combined rail-and-road

link. The 31 -mi (50-km) tunnel, which opened in 1994, consists of three separate tunnels, two for rail traffic and a central tunnel for services and security. Trains, which carry motor vehicles as well as passengers, can travel through the tunnel at speeds as high as 100 mph (160 kph).

Charming, William Ellery (b. April 7, 1780, Newport, R.I., U.S. — d. Oct. 2, 1842, Bennington, Vt.) U.S. Unitarian clergyman. He studied theology at Harvard University and became a successful preacher. From 1803 until his death he was pastor of Boston's Federal Street Church. He began his career as a Congregationaust but gradually adopted liberal and rationalist views that came to be labeled Unitarian. In 1820 he established a conference of liberal Congregationalist clergy, later reorganized as the American Unitarian Association. Known as the "apostle of Unitarianism," he also became a leading figure in New England Transcendentalism, and his lectures and essays on slavery, war, and poverty made him one of the most influential clergymen of his day.

chanson \sha n -'so n \ French "song" French art song. The unaccompanied chanson for a single voice part, composed by the troubadours and later the trouveres, first appeared in the 12th century. Accompanied chansons, with parts for one or more instruments, were written in the 14th—15th centuries by Guillaume de Machaut and others in the strict formes fixes

Chaney.

/N BROTHERS

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chanson de geste > Chapman I 373

("fixed forms"). About 1,500 chansons for several voices began to be written by Josquin des Prez and his contemporaries. In recent centuries the term has often been used for any cabaret-style French song.

chanson de geste \sha n - , s6 n -do- , zhest\ Any of several Old French epic poems that form the core of the Charlemagne legends. More than 80 chansons de geste have survived in 12th- to 15th-century manuscripts. Dealing chiefly with events of the 8th-9th century, they contain a core of historical truth overlain with legend. Most are anonymous. The Chanson de Roland was the formative influence on later chansons de geste, which in turn influenced literature throughout Europe.

Chanson de Roland \sha n -'s6 n -d9-r6-'la n \ English "Song of Roland" Old French epic poem written c. 1100, the masterpiece and probably the earliest of the chanson de geste form. Its probable author was a Norman, Turold (Turoldus), whose name is introduced in its last line. It deals with the Battle of Roncesvalles (778), a skirmish against the Basques that the poem portrays as a heroic battle against the Saracens. Direct and sober in style, it highlights a clash between the recklessly cou-

rageous Roland and his prudent friend Oliver, which is also a conflict between divergent conceptions of feudal loyalty.

chant See Byzantine chant, Gregorian chant

chanterelle \,shan-t9-'rel\ Highly prized, fragrant, edible mushroom (Cantharellus cibarius, order Polyporales), rich yellow in colour, found in woods in summer and autumn. Its similarity to the poisonous jack-o-lantem (Clitocybe illudens, order Agaricales), an orange-yellow fungus of woods and stumps that glows in the dark, emphasizes the need for careful identification by the mushroom gatherer.

Chantilly lace \shan-'ti-le\ Lace made at Chantilly, north of Paris, from the 17th century. The silk laces that made the town famous date from the 18th century. Black, white, and blond lace (derived from natural silk) were made in the 19th century, and by 1840 machine-made imitations were available. The designs are characterized by naturalistic flowers and ribbons on a spotted background.

Chantilly porcelain Either of two types of soft-paste porcelain produced from c. 1725 to c. 1800 at Chantilly, France. In the first type, made until c. 1750, an opaque, milk-white tin glaze was applied to a yellowish ground; the designs were simplified Japanese patterns. In the second type (c. 1750-1800), a traditional transparent lead glaze was applied over a coloured ground; the designs were influenced by Meissen and Sevres porcelain. Production consisted primarily of domestic ware (plates, basins, jugs) with painted decoration in a limited palette. The motifs were often small flower bouquets, known as Chantilly sprigs, or scrolls and plaits.

Chao Phraya River \chau-'pri-o\ or Maenam River \ma-'nam\

River, Thailand. Flowing south from the highlands on the country’s northern border to the head of the Gulf of Thailand near Bangkok, it is some 225 mi (365 km) long and is Thailand’s principal river. It is important for the transport of the country’s exports. It also forms a highly productive agricultural valley. The name strictly applies only to the river’s lower course, which begins at the confluence of the Nan and Ping riv-

ers and is 140 mi (225 km) long.

Chaos \'ka-,as\ In Greek cosmology, either the primeval emptiness before things came into being or the abyss of Tartarus, the underworld. In Hesiod’s Theogony, there was first Chaos, then Gaea and Eros. The offspring of Chaos were Erebus (Darkness) and Nyx (Night). Ovid gave Chaos its modern meaning: the original formless and disordered mass from which the ordered universe is created. The early church fathers applied this interpretation to the creation story in Genesis.

chaos theory \'ka-,as\ Mathematical theory that describes chaotic behavior in a complex system. Applications include the study of turbulent flow in fluids, irregularities in biological systems, population dynamics, chemical reactions, plasma physics, meteorology, the motions of groups and clusters of stars, transportation dynamics, and many other fields.

chaotic behaviour Behaviour in a complex system that appears irregular or unpredictable but is actually determinate. The apparently random or unpredictable behaviour in systems governed by complicated (nonlinear) deterministic laws is the result of high sensitivity to initial conditions. For example, Edward Lorenz discovered that a simple model of heat convection exhibits chaotic behaviour. In a now-classic example of such sensitivity to initial conditions, he suggested that the mere flapping of a butterfly’s wings could eventually result in large-scale changes in the weather (the “butterfly effect”).

Chapala \cha-'pa-la\, Lake Lake, Jalisco state, Mexico. Mexico’s largest lake, it is about 50 mi (80 km) long and 10 mi (15 km) wide and has an area of roughly 400 sq mi (1,000 sq km). A popular resort area, it is both fed and drained by the Lerma River.

chaparral N.sha-po-'ralV Vegetation composed of broad-leaved evergreen shrubs, bushes, and small trees, often forming dense thickets. Chaparral is found in regions with a Mediterranean climate, characterized by hot, dry summers and mild, wet winters. The name is applied mainly to the coastal and inland mountain vegetation of southwestern North America. Chaparral vegetation becomes extremely dry by late summer. The fires that commonly occur during this period are necessary for the germination of many shrub seeds, and they clear away dense ground cover, thus maintaining the shrubby growth form of the vegetation by preventing the spread of trees. New chaparral growth provides good grazing for domestic livestock, and chaparral vegetation also is valuable for watershed protection in areas with steep, easily eroded slopes.

chaparral cock See roadrunner

Chaplin, Charlie in full Sir Charles Spencer Chaplin (b. April 16, 1889, London, Eng. — d. Dec. 25, 1977, Corsier-sur-Vevey, Switz.) British-U.S. actor and director. The son of poverty-stricken music-hall entertainers, he became a vaudeville performer at age eight. On tour in New York (1913), he caught the eye of Mack Sennett, who signed him to a film contract. While making his second film, Kid Auto Races at Venice (1914), Chaplin developed the costume — baggy pants, derby hat, oversized shoes, and cane — that was to become the hallmark of his famous “little tramp” character. He was soon directing his own films, and he became an instant star in The Tramp (1915). After cofounding United Artists in 1919, he produced, directed, and starred in such classics as The

Gold Rush (1925), City Lights (1931), Modern Times (1936), The Great Dictator (1940), Monsieur Verdoux (1947), and Limelight (1952). Harassed for his leftist political views, he moved to Switzerland in 1952. In 1972 he returned to the U.S. to accept a special Academy Award.

Chapman, Frank Michler (b. June 12, 1864, Englewood, N.J., U.S. — d. Nov. 15, 1945, New York, N.Y.) self-taught U.S. ornithologist. He began his career at the American Museum of Natural History in 1887 and was curator of ornithology in 1908^42; his exhibits were some of the first to display birds in naturalistic settings. He founded and edited (1899—1935) the magazine Bird-Lore. Among his many important works are Handbook of Birds of Eastern North America (1895) and several on South American birds.

Chapman, Maria Weston orig. Maria Weston (b. July 25, 1806, Weymouth, Mass., U.S. — d. July 12, 1885, Weymouth) U.S. abolitionist. She was principal of the Young Ladies' High School in Boston from 1828 to 1830, when she married Henry Chapman, a Boston merchant. In 1832, with 12 other women, she founded the Boston Female Anti-Slavery Society. Later she became chief assistant to William Lloyd Garrison, helping him to run the Massachusetts Anti-Slavery Society and to edit The Liberator, a widely circulated abolitionist publication. In 1839 she published

Chantilly lace from France, c. 1 870; in the Institut Royal du Patrimoine Artistique, Brussels.

COURTESY OF THE INSTITUT ROYAL DU PATRIMOINE ARTISTIQUE, BRUSSELS; PHOTOGRAPH, © A.C.L., BRUSSELS

Chantilly porcelain plate decorated with dragons, c. 1 725; in the Victoria and Albert Museum, London

COURTESY OF THE VICTORIA AND ALBERT MUSEUM, LONDON

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a pamphlet arguing that the divisions among abolitionists stemmed from their disagreements over women's rights.

Chapultepec \cha-'pul-ta-,pek\ Rocky hill, southwest of Mexico City, Mexico. The Aztecs fortified it and built a religious centre and a residence for their rulers in the early 14th century. The Spanish cONQUiSTADORes built a chapel in 1554, and in the 1780s the Spanish viceroys constructed a

summer palace there that later became the home of the National Military Academy (1841). The hill was captured by a U.S. assault (1847) in the Mexican War. In the 1860s Mexico's Emperor Maximilian rebuilt the castle; it remained the official residence of Mexican presidents until 1940, when it was converted into a museum.

char Any of several freshwater food and game fishes (genus Salve linus) of the salmon family, distinguished from the similar trout by light, rather than black, spots; by a boat-shaped, rather than flat, vomer (bone) on the roof of the mouth; and by having teeth on the front of the vomer rather than on the shaft. Char often have smaller scales than their relatives. The Arctic char, of North America and Europe, inhabits the Arctic and adjacent oceans and enters rivers and lakes to breed. It may weigh 15 lbs (7 kg) or more. The brook trout, Dolly Varden trout, and lake trout are native North American char.

charcoal Impure form of carbon, obtained as a residue when material containing carbon is partially burned or heated with limited access to air. Coke, carbon black, and soot are forms of charcoal; other forms are named for their source material, such as wood, blood, or bone. Largely replaced by coke in blast furnaces and by natural gas as a raw material, charcoal is still used to make black gunpowder and in case-hardening metals. Activated charcoal is a finely powdered or highly porous form whose surface area is hundreds or thousands of square meters per gram. It has many uses as an adsorbent (see adsorption), including for poison treatment, and as a catalyst or catalyst carrier.

Charcot \shar-'ko\, Jean-Martin (b. Nov. 29, 1825, Paris, Fr. — d. Aug. 16, 1893, Morvan) French medical teacher and clinician. With Guillaume Duchenne (b. 1806 — d. 1875) he is considered the founder of modern neurology. In 1882 he opened Europe's greatest neurological clinic of the day. An extraordinary teacher, he was known for his work with hysteria and hypnosis, which influenced many students, including Sigmund Freud. He described the symptoms of locomotor ataxia and the disintegration of ligaments and joint surfaces it causes (Charcot disease, Charcot joint), pioneered the linking of brain sites with specific functions, and discovered miliary aneurysms in the brain.

chard or Swiss chard Edible-leaf beet {Beta vulgaris, variety cicla), a variety of beet in which the tender leaves and leafstalks have become greatly developed. They are a good source of vitamins A, B, and C.

Chard is popular as a home-garden pot herb because it is easy to grow, productive, and tolerant of moderate heat. Highly perishable, it is difficult to ship to distant markets.

Chardin \shar-'da n \, Jean-Baptiste-Simeon (b. Nov. 2,

1699, Paris, France— d. Dec. 6,

1779, Paris) French painter. He first received acclaim in 1728, when he became a member of the Royal

Academy of Painting in Paris. He became known as a successful painter of still lifes and domestic scenes that were remarkable for their intimate realism, tranquil atmosphere, and luminosity. In his later years he produced stunning pastel portraits. He was the greatest still-life painter of the 18th century, well known in his lifetime through engravings of his work. The meditative quiet of his work contrasts with the spirit of light and superficial brilliance seen in the work of many of his contemporaries. Many 20th-century artists were inspired by the abstract qualities of his compositions.

Charente River \sha-'raiit\ River, western France. Rising in the department of Haute- Vienne, it flows generally westward 226 mi (360 km) to the Bay of Biscay. It receives its chief tributary, the Boutonne, from the plain of Poitou to the north. It is navigable for small craft as far as Angouleme.

charge-coupled device See CCD

Chargoggagoggmanchauggauggagoggchaubunagungamaugg Vchar-.go-go-.gog-man-.cho-.go-go-.gog-cho-.bo-ns-'goq-go-,m6g\, La Ice or Lake Webster Lake, central Massachusetts, U.S. Located in southern Worcester county, near the town of Webster, the lake's Indian name is reportedly Nipmuc (Algonquian) for "You fish on your side; I fish on my side; nobody fishes in the middle." Not surprisingly, the lake is commonly called Lake Webster.

Chari \'sha-re\ River or Shari River River, north-central Africa. It flows about 590 mi (949 km) from the Central African Republic northwest into Lake Chad; it has many tributaries in the Central African Republic. N'Djamena is at the head of the river's delta.

chariot Open two- or four-wheeled vehicle of ancient origin. The chariot probably originated in Mesopotamia about 3000 bc; early monuments show heavy vehicles with solid wheels. Chariots were probably first used in royal funeral processions. Two- wheeled horse-drawn versions evolved for speed in battle c. 2000 bc, appearing first in Greece and later in Egypt and the eastern Mediterranean. Chariot racing was popular in Greece at the Olympic Games; in Rome it was the main event in the circus games, where two to four horses drew each lightweight chariot in a competition of four or six vehicles; and in Byzantium such races became the dominant events of civic life.

charismatic movement See Pentecostalism

Charlemagne Vshar-h-.manX or Carolus Magnus ("Charles the Great") (b. April 2, c. 742 — d. Jan. 28, 814, Aachen, Austrasia) King of the Franks (768-814) and emperor (800-14). The elder son of the Frankish king Pippin III (the Short), he ruled the Frankish kingdom jointly with his brother Carloman until the latter's death in 771. He then became sole king of the Franks and began a series of campaigns to conquer and Christianize neighbouring kingdoms. He defeated and became king of the Lombards in northern Italy (774). His expedition against the Muslims in Spain failed (778), but he successfully annexed Bavaria (788). Charle-

magne fought against the Saxons for many years, finally defeating and Christianizing them in 804. He subdued the Avars of the Danube and gained control of many of the Slav states. With the exception of the British Isles, southern Italy, and part of Spain, he united in one vast state almost all the Christian lands of western Europe. His coronation as emperor at Rome on Christmas Day, 800, after restoring Leo III to the papacy, marks the revival of the empire in Latin Europe and was the forerunner of the Holy Roman Empire. Charlemagne established his capital at Aachen (Aix-la-Chapelle), where he built a magnificent palace. He invited many scholars and poets to assist him in the promotion of the religious and cultural revival known as the Carolingian renaissance. He also codified the laws and increased the use of writing in government and society. He was succeeded on his death by his son Louis the Pious, whom Charlemagne had crowned coemperor in 813. See also Carolingian dynasty.

Charleroi \shar-b-'rwa\ City (pop., 2000 est.: 200,800), southwestern Belgium. Following the Treaty of the Pyrenees (1659), in which Spain was ceded French territory, Spain in 1666 decreed that a new fortress, named for Charles II of Spain, be built there, at the site of a medieval village. It was strategically important in the 17th– 19th centuries and was held variously by France, Spain, Austria, and Holland. Though the fortress was dismantled in the late 19th century, the area retained its strategic importance; it was the scene of one of the first battles of World War I.

Charles (Philip Arthur George), prince of Wales (b. Nov. 14, 1948, Buckingham Palace, London, Eng.) Heir apparent to the British throne, son of Elizabeth II and Philip, duke of Edinburgh. In 1971 he studied at the University of Cambridge, becoming the first heir to the throne to obtain a university degree, and he later attended the Royal Air Force College and the Royal Naval College, Dartmouth. He took a tour of duty with the Royal Navy (1971-76). In 1981 he married Lady Diana Spencer (see Diana, princess of Wales), and they had two sons, William and Henry. Their marriage grew strained amid intense scrutiny from the press and rumours of infidelity; they divorced in 1996. He subsequently began publicly keeping company with Camilla Parker Bowles (b. 1947), and they married in 2005. He has been known for his advocacy of excellence in architecture and other causes.

Chard (Beta vulgaris variety cicla).

W.H. HODGE

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Charles ► Charles III I 375

Charles, Ray orig. Ray Charles Robinson (b. Sept. 23, 1930, Albany, Ga., U.S. – d. June 10, 2004, Beverly Hills, Calif.) U.S. pianist, singer, and songwriter. His family moved to Greenville, Fla., where he began his musical career at age 5 in a neighbourhood cafe. By age 7 he

had completely lost his sight. He learned to write scores in Braille. Orphaned at 15, he left school to play professionally. He recorded “Mess Around” and “It Should’ve Been Me” in 1952-53, and his arrangement for Guitar Slim’s “The Things That I Used to Do” became a million-seller. Combining blues and gospel music influences, a distinctive raspy voice, and liquid phrasing, Charles later had hits with “What’d I Say,” “Georgia on My Mind,” and “Hit the Road, Jack.” His Modern Sounds in Country and Western Music (1962), marking unusual territory for a black performer, sold more than a million copies. He received 13 Grammy Awards, including a lifetime achievement award in 1987. Charles was inducted into the Rock and Roll Hall of Fame in 1986.

Charles I German Karl Franz Josef (b. Aug. 17, 1887, Persenbeug Castle, Austria — d. April 1, 1922, Quinta do Monte, Madeira) Emperor of Austria (1916-18) and king of Hungary (as Charles IV), last ruler of the Austro-Hungarian monarchy. He became heir presumptive to the Habsburg throne on the assassination of his uncle, Francis Ferdinand. After he succeeded Francis Joseph in 1916, he made several abortive attempts to take Austria-Hungary out of World War I. He renounced participation in affairs of state in 1918 and was deposed in 1919. After two failed attempts to regain his Hungarian throne in 1921, he was sent into exile in Madeira, where he died.

Charles I (b. Nov. 19, 1600, Dunfermline Palace, Fife, Scot. — d. Jan. 30, 1649, London, Eng.) King of Great Britain and Ireland (1625^-9). Son of James I, he acquired from his father a belief in the divine right of kings, and his earliest surviving letters reveal a distrust of the House of Commons. He became king in 1625 and soon after married Henrietta Maria. He came into conflict with his first Parliament because of religious issues, his war against Spain, and the general distrust of his adviser the 1st duke of Buckingham. After dissolving several successive Parliaments, Charles ruled his kingdom for 11 years without calling a Parliament. Among the measures he took to be independent of parliamentary grants was the levying of ship money. In 1639 he went to war against Scotland, and the need to raise money prompted him to summon what came to be known as the Short Parliament and the Long Parliament. Eventually his authoritarian rule and quarrels with Parliament provoked the English Civil Wars. After his forces were defeated in the second of these wars, the army demanded that he stand trial for treason as “the grand author of our troubles.” In 1649 he was convicted and executed, and Oliver Cromwell proclaimed the Commonwealth.

Charles I Hungarian Karoly known as Charles Robert of Anjou

Van-jii\ (b. 1288, Naples, Kingdom of Naples — d. July 16, 1342, Visegard. Hung.) King of Hungary (1301, 1308 — 42). He claimed the Hungarian throne with papal approval and was crowned in 1301, but his claim was disputed, and he was not recognized as king until 1308. A courtly and pious ruler, Charles restored Hungary to the status of a great power. An alliance with Poland enabled him to defeat the Holy Roman emperor and the Austrians. He failed to unite Hungary and Naples but negotiated a pact providing that his eldest son would become king of Poland.

Charles I known as Charles of Anjou Van-jii\ (b. March 1226 — d. Jan. 7, 1285, Foggia, Kingdom of Naples [Italy]) King of Naples and Sicily (1266-85), the first of the Angevin dynasty. The younger brother of Louis IX of France, Charles allied with the papacy and conquered Naples and Sicily in the 1260s, defeating the last representatives of the Hohen-

staufen dynasty. He created a great but short-lived Mediterranean empire, expanding into the Balkans and becoming heir to the kingdom of Jerusalem (1277). The Sicilians rebelled against French domination in 1282 (see Sicilian Vespers) and drove out the Angevins in 1284. Charles died while preparing a counteroffensive, and his kingdom was eventually secured by the Spanish.

Charles II (b. May 29, 1630, London, Eng. — d. Feb. 6, 1685, London) King of Great Britain and Ireland (1660-85). Son of Charles I and Henrietta Maria, he supported his father in the English Civil Wars. After his father's execution, he invaded England in 1651 but was defeated at Worcester. He then spent years in exile until Oliver Cromwell died and conditions favored a return to the monarchy. His Declaration of Breda paved the way for him to be proclaimed king in May 1660 (see Restoration). He became known as "the Merry Monarch" for his lifting of Puritan restrictions on entertainment and his own love of pleasure; his best-known mistress was the actress Nell Gwyn. Important events of his reign included the controversial Treaty of Dover and two wars with the Dutch (see Anglo- Dutch Wars). By the 1670s the miscarriages of his queen, Catherine of Braganza, had reduced hopes that he would have a legitimate heir (though he left at least 14 illegitimate offspring). He almost lost control of his government when hysteria arose over the Popish Plot to replace him with his Roman Catholic brother James (the future James II). Charles kept his nerve, reestablished his political control, and eventually enjoyed a resurgence in loyalty. His political adaptability and acumen enabled him to steer his country through the struggle between Anglicans, Catholics, and dissenters that marked his reign.

Charles II known as Charles of Anjou \'an-ju\ or Charles the Lame (b. c. 1254 — d. May 5, 1309, Naples) King of Naples and ruler of several other European territories. He guarded Naples while his father, Charles I, launched a campaign to regain Sicily from the Aragonese. He was captured and imprisoned (1284-88); on being freed he promised to give up his claim to Sicily, but the pope released him from the vow, and he fought unsuccessfully for Sicily until 1302. He built alliances through the marriages of his children and extended his control over Piedmont, Provence, Hungary, Athens, and Albania.

Charles II Spanish Carlos (b. Nov. 6, 1661, Madrid, Spain — d. Nov. 1, 1700, Madrid) King of Spain (1665-1700), the last monarch of the Spanish Habsburg dynasty. Son of Philip IV and Maria Anna of Austria, he was slow-witted and became known as Charles the Mad. His reign opened with a 10-year regency under the queen mother. The first phase of his personal government was concerned with resistance to the French imperialism of Louis XIV, and the second was dominated by the succession problem, for it was clear that he would father no children. His death led to the War of the Spanish Succession.

Charles II known as Charles the Bad (b. 1332 — d. Jan. 1, 1387) King of Navarra (1349-87). He acquired Normandy from John II of France by threatening an English alliance. Arrested for his treachery in 1356, he escaped a year later and regained Normandy. He pursued shifting alliances in Spain in an effort to expand Navarrese power. Charles V voided his claims in France, and the discovery of his plot to poison the French king cost him all of Normandy except Cherbourg.

Charles II known as Charles the Bald (b. June 13, 823 — d. Oct. 6, 877, Brides-les-Bain, Fr.) Carolingian king (843-77) and emperor (875-77). He was the son of the emperor Louis I and his second wife Judith. Louis's efforts to include Charles in the succession led to revolts against the emperor by his three older sons. After the death of Louis, Charles fought his two surviving half brothers in a bloody civil war (840^13) that was concluded with the Treaty of Verdun, which settled the terms of succession. Charles was granted the kingdom of the western Franks, which he ruled with the support of the bishops despite the wavering loyalties of his vassals and the attacks of Norsemen, Bretons, and Germans. In 864 he won control of Aquitaine, and in 870 he gained western Lorraine. He was crowned emperor in 875 but died two years later in the midst of invasion and internal revolt. Inspired by his grandfather, Charlemagne, Charles was a patron of the arts and oversaw the revival of the splendours of the Carolingian renaissance.

Charles III known as Charles the Simple (b. Sept. 17, 879 — d. Oct. 7, 929, Peronne, France) King of France (893-922). In 911 he ceded territory by treaty, in the area later known as Normandy, to the Vikings, to end their raids; their descendants became the Normans. The magnates of Lorraine (Lotharingia) accepted Charles's authority on the death of their last Carolingian king. His preoccupation with Lotharingian affairs alienated the French nobles, and in 922 they elected Robert I king in his stead.

Charles III Spanish Carlos (b. Jan. 20, 1716, Madrid, Spain — d. Dec. 14, 1788, Madrid) King of Spain (1759-88). Son of Philip V and Isabella Farnese, he was duke of Parma (1732-34) and king of Naples (as Charles VII, 1734-59) before becoming king of Spain. He was convinced of his mission to reform Spain and make it once more a first-rate power, but his foreign policy was not successful; Spain's losses in the Seven Years' War revealed naval and military weakness. He was more successful in strengthening his own empire; during his reign Spain undertook commercial reforms, made territorial adjustments in the interest of defense, and introduced a modern administrative system. One of the enlightened despots of the 18th century, he helped lead Spain to a brief cultural and economic revival.

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Charles III known as Charles the Fat (b. 839, Bavaria? [Germany] — d. Jan. 13, 888, Neidingen) Frankish king and emperor (88 1—87). The great-grandson of Charlemagne, he inherited the kingdoms of Swabia (876) and Italy (879). Charles was crowned emperor by the pope in 881. He gained control of the eastern and western Frankish kingdoms on the deaths of their rulers, and by 885 he had reunited all of Charlemagne's empire except Provence. Chronically ill, he failed to attack the Saracens and used tribute to buy off Viking invaders. His nephew Arnulf led an uprising against him in 887, and his fall marked the final disintegration of the empire of Charlemagne.

Charles IV known as Charles the Fair (b. 1294 — d. Feb. 1, 1328, Vincennes, Fr.) King of France and of Navarre (as Charles I) 1322-28. The last of the direct line of the Capetian dynasty, he took the throne on the death of his brother Philip V. His intrigues aimed at gaining the German throne and annexing Flanders were unsuccessful. He renewed war with England by invading Aquitaine and won a generous settlement in the peace of 1327.

Charles IV orig. Wenceslas known as Charles of Luxembourg

(b. May 14, 1316, Prague — d. Nov. 29, 1378, Prague) King of the Germans and of Bohemia (1346-78) and Holy Roman emperor (1355-78). Charles was elected German king in place of Louis IV in 1346. That same year his father died in a war against England, and Charles became king of Bohemia. He invaded Italy and won the crown of Lombardy as well as the imperial crown at Rome. Charles enlarged his dynastic power through skillful diplomacy and made Prague the political and cultural center of the empire. He issued the Golden Bull of 1 356 and won the right of succession to the German throne for his son Wenceslas.

Charles IV Spanish Carlos (b. Nov. 11, 1748, Portici, Kingdom of Naples — d. Jan. 20, 1819, Rome) King of Spain (1788-1808) during the turbulent period of the French Revolution. Son of Charles III, he lacked leadership qualities and entrusted the government to Manuel de Godoy. After a French invasion in 1794, Spain was reduced to the status of a French satellite. When Napoleon again occupied northern Spain in 1807, Charles was forced to abdicate (1808) and go into exile.

Charles V known as Charles the Wise (b. Jan. 21, 1338, Vincennes, France — d. Sept. 16, 1380, Nogent-sur-Marne) King of France (1364-80). He raised money to ransom his father, John II, from the English, under the terms of the Treaty of Bretigny. Crowned king on his father’s death in 1364, Charles helped the country recover its losses in the first phase of the Hundred Years' War. When war with England broke out again (1369), he won a series of victories for the French that nullified the damaging treaties of 1360. The plots of his enemy Charles II (of Navarra) prompted him to seize most of the king’s French lands. His support of Pope Clement VII helped cause the Western Schism.

Charles V German Karl (b. Feb. 24, 1500, Ghent— d. Sept. 21, 1558, San Jeronimo de Yuste, Spain) Holy Roman emperor (1519-56) and king of Spain (as Charles I, 1516-56). Son of Philip I of Castile and grandson of Ferdinand V and Isabella I and of Emperor Maximilian I, he succeeded to his grandfathers’ kingdoms on their deaths in 1516 and 1519, respectively. Important events of his reign include the Diet of Worms and the beginning of the Reformation; his defeat of Francis I, which assured Spanish supremacy in Italy (see Italian Wars); wars against Turkey under Suleyman I; the formation of the Schmalkaldic League; the Council of Trent; and the Peace of Augsburg. He struggled to hold his vast Spanish and Habsburg empire together against the growing forces of Protestantism, Turkish and French pressure, and even hostility from Pope Adrian VI. In 1555-56 Charles abdicated his claims to the Netherlands and Spain in favour of his son Philip II and the title of emperor to his brother Ferdinand I, and in 1557 he retired to a monastery in Spain.

Charles VI known as Charles the Well-Beloved or Charles the

Mad (b. Dec. 3, 1368, Paris, Fr. — d. Oct. 21, 1422, Paris) King of France

(1380-1422). Crowned at age 11, he allowed his uncles and advisers to rule France until 1388. He suffered fits of madness from 1392, and royal power waned as the dukes of Burgundy and Orleans grew stronger. The English invasion and victory at the Battle of Agincourt (1415) obliged Charles to sign the Treaty of Troyes (1420), which provided for the marriage of his daughter Catherine of Valois to Henry V of England, who was declared regent of France and heir to the French throne.

Charles VI German Karl (b. Oct. 1, 1685, Vienna, Austria — d. Oct. 20, 1740, Vienna) Holy Roman emperor (171 1 — 40) and king of Hungary

(as Charles III). Son of Emperor Leopold I, he tried unsuccessfully to claim the Spanish throne (as the pretender Charles III), which caused the War of the Spanish Succession. He conducted a successful war against the Ottoman Empire (1716-18) but lost the War of the Polish Succession (1733—38), and a new conflict with Turkey (1736-39) resulted in the loss of most of the territories gained in 1718. He promulgated the Pragmatic Sanction in an attempt to ensure that his daughter Maria Theresa would succeed him, which led to the War of the Austrian Succession.

Charles VII (b. Feb. 22, 1403, Paris, France — d. July 22, 1461, Mehun-sur-Yevre) King of France (1422-61). Despite the treaty signed by his father, Charles Vl, which excluded his succession, Charles assumed the title of king on his father’s death. In 1429, with the aid of Joan of Arc, he raised the siege of Orleans. He drove the English from France (1436) and gradually recovered French lands, ending the Hundred Years' War. His financial and military reforms increased the power of the monarchy.

Charles VII German Karl Albrecht (b. Aug. 6, 1697 — d. Jan. 20, 1745, Munich) Elector of Bavaria (1726-45) and Holy Roman emperor (1742-45). He renounced any claims to the Austrian succession when he recognized the Pragmatic Sanction. However, on the death of Emperor Charles VI, he joined the alliance against Maria Theresa and was crowned emperor in 1742. Meanwhile, Bavaria was overrun by Austrian troops. He was restored by Prussia and France to his Bavarian lands in 1744 but died soon after.

Charles VIII (b. June 30, 1470, Amboise, France — d. April 7, 1498, Amboise) King of France (1483-98). He abandoned claims to parts of present-day France and Spain, and he consolidated French ownership of Brittany, in preparation for his grand enterprise, an expedition to Italy to assert his inherited right to the kingdom of Naples. This inaugurated wars with Italy that lasted more than 50 years and gained little in return for vast outlays. Charles was crowned in Naples in 1495, but his opponents rallied against him and he lost his conquests. He died while preparing another expedition.

Charles IX (b. June 27, 1550, Saint-Germain-en-Laye, near Paris, France — d. May 30, 1574, Vincennes) King of France (1560-74). Son of Catherine de Medicis, he became king on the death of his brother Francis II. under his mother’s regency. Though he was proclaimed of age in 1563, he remained under his mother’s domination. His reign was marked by conflicts between Catholics and Huguenots, and he was remembered for authorizing the Saint Bartholomew's Day Massacre (1572) at his mother’s instigation, an event that apparently haunted him the rest of his life. He died of tuberculosis at age 23.

Charles IX Swedish Karl (b. Oct. 4, 1550, Stockholm, Swed. — d. Oct. 30, 1611, Nykoping) King of Sweden (1604-11). Third son of Gustav I Vasa, he helped lead a rebellion against the rule of his half brother Erik XIV that placed his other brother on the throne as John III. After the accession (1592) of his devoutly Catholic nephew, Sigismund III, Charles called the Convention of Uppsala, which demanded that Lutheranism be retained as the national religion. He opposed Sigismund in a civil war, and after the latter was deposed Charles became the virtual ruler of Sweden (1599-1604). Declared king in 1604, he pursued an aggressive foreign policy that led to war with Poland (1605) and Denmark (the Kalmar War, 1611-13).

Charles X (b. Oct. 9, 1757, Versailles, France — d. Nov. 6, 1836, Gorizia, Friuli) King of France (1824-30). Fifth son of the dauphin Louis, and grandson of Louis XV, until 1 824 he was known as Charles-Philippe, count d' Artois. During the French Revolution he went into exile and became the leader of the emigre nobility. Returning to France in 1814, he led the ultras during the Bourbon Restoration. On the death of his brother Louis XVIII, Charles became king. His popularity waned as his reign became increasingly reactionary. After the July Revolution he was forced to abdicate in favour of Louis- Philippe. His reign dramatized the failure of the Bourbons to reconcile the tradition of the monarchy by divine right with the democratic spirit produced in the wake of the Revolution.

Charles X Gustav Swedish Karl Gustav (b. 1622 — d. 1660) King of Sweden (1654-60). Nephew of Gustav II Adolf, he failed in his efforts to marry the Swedish queen Christina, but she named him to succeed her. As king he attempted to restore the public finances but was forced to devote most of his attention to military matters. He conducted the First Northern War (1655-60) against a coalition that eventually included Poland, Russia, Brandenburg, the Netherlands, and Denmark, with the aim

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of establishing a unified northern state. After conquering Poland (1655—56), he won back lands in southern Sweden from Denmark by the Treaty of Roskilde (1658).

Charles XI Swedish Karl (b. Nov. 24, 1655, Stockholm, Swed. — d. April 5, 1697, Stockholm) King of Sweden (1660-97). At age five he succeeded his father, Charles X Gustav, and the kingdom was ruled under a regency of aristocrats until Charles came of age in 1672. The regents drew Sweden into the Dutch War (1672-78), but Charles took control of the armies and won favorable results for Sweden by the Treaties of Nijmegen, after which he maintained a foreign policy of neutrality. Within Sweden, Charles expanded royal power at the expense of the higher nobility and established an absolutist monarchy.

Charles XII Swedish Karl (b. June 17, 1682, Stockholm, Swed. — d. Nov. 30, 1718, Fredrikshald, Nor.) King of Sweden (1697-1718). Son of Charles XI, he became absolute monarch at age 15. He defended his coun-

try for 18 years in the Second Northern War, gradually taking increased responsibility for planning and executing armed operations. He launched a disastrous invasion of Russia (1707-09) that resulted in the collapse of the Swedish armies and the loss of Sweden's status as a great power. Ruling early in the Enlightenment, he promoted significant domestic reforms. He was killed during an invasion of Norway.

Charles XIII Swedish Karl (b. Nov. 8, 1622, Nykoping Castle, Swed. — d. Feb. 13, 1660, Goteborg) King of Sweden (1809-18) and first king of the union of Sweden and Norway (1814-18). Second son of King Adolf Frederick (1710-71), he served as admiral of the fleet in the Russo-Swedish war. On the death of his brother Gustav III (1792), Charles became regent for his nephew Gustav IV. After the latter's deposition in 1809, Charles was elected king. He was prematurely aged and childless. In 1810 Jean-Baptiste Bemadotte (later Charles XIV John) was named heir apparent; from then on, Charles was eclipsed by the crown prince.

Charles XIV John Swedish Karl Johan orig. Jean-Baptiste Bernadotte (b. Jan. 26, 1763, Pau, France — d. March 8, 1844, Stockholm, Swed.) King of Sweden and Norway (1818-44). He became an ardent supporter of the French Revolution and rose rapidly in the army ranks to brigadier general (1794). Named marshal of France in 1804, he supported Napoleon in several campaigns (1805-09) but subsequently shifted his allegiance. In 1810 he was invited to become crown prince of Sweden; taking the name of Charles John, he assumed control of the government. He helped defeat Napoleon at the Battle of Leipzig, then defeated France's ally Denmark, forcing that country to transfer Norway to the Swedish crown. On the death of Charles XIII in 1818, Charles John became king of Sweden and Norway. His foreign policy led to a long and favourable period of peace.

Charles Albert Italian Carlo Alberto (b. Oct. 2, 1798, Turin, Piedmont, French Republic — d. July 28, 1849, Oporto, Port.) King of Sardinia-Piedmont (1831-49). A member of the house of Savoy, he ascended the throne after the death of Charles Felix in 1831. He mitigated the harsh administration of his country and accelerated its economic and social development. The spread of revolutionary ideas forced him to grant a statute for representative government in 1848. After the election of Pius IX as pope and the Austrian occupation of Ferrara, he sought to lead the liberation of Italy. He went to war against Austria in 1848 and again in 1849, but, after his defeat in the Battle of Novara, he abdicated in favor of his son, Victor Emmanuel II.

Charles Edward, the Young Pretender orig. Charles Edward Louis Philip Casimir Stuart known as Bonnie Prince Charlie (b. Dec. 31, 1720, Rome — d. Jan. 31, 1788, Rome) Claimant to the British throne. He was the son of the royal pretender James Edward and grandson of the exiled James II of England. Seeking to regain the throne, in 1745 the "Young Pretender" landed in Scotland, where he raised an army of 2,400 among the clans. After taking Edinburgh and routing the English at Prestonpans, he crossed the English border and reached Derby, but a lack of strong support from the Jacobites and the French forced his retreat into Scotland. He was decisively defeated at the Battle of Culloden (1746) and, aided by Flora Macdonald (1722-90) and disguised as her maid, escaped to France. He wandered about Europe trying to revive his cause, but his debauched behaviour alienated his friends. He settled in Italy in 1766. He later became romanticized in ballads and legends.

Charles Martel \mar-'tel\ Latin Carolus Martellus ("Charles the Hammer") (b. c. 688 — d. Oct. 22, 741, Quierzy-sur-Oise, Fr.)

Carolingian mayor of the palace (715 — 41). He was a child born out of wedlock to Pippin of Herstal, mayor of the palace and virtual ruler of the Frankish realm in the waning days of the Merovingian dynasty. On his father's death he overcame family opposition and rivals among the nobility to reunite and rule the entire Frankish realm. He subdued Neustria (724), attacked Aquitaine, and fought against the Frisians, Saxons, and Bavarians. His victory at the Battle of Tours/ Poitiers (732) stemmed the Muslim invasion, and he controlled Burgundy by 739. He also supported the activities of St. Boniface and other missionaries. In Frankish royal tradition, he divided the kingdom between his sons Pippin III and Carloman who succeeded him as mayor; his grandson was Charlemagne.

Charles of Anjou See Charles I (Naples)

Charles of Luxembourg See Charles IV (Holy Roman Empire)

Charles River River, eastern Massachusetts, U.S. The longest river wholly in the state, it flows into Boston Bay after a course of about 80 mi (130 km). Navigable for about 7 mi (11 km), its estuary separates the cities of Boston and Cambridge.

Charles Robert of Anjou See Charles I (Hungary)

Charles the Bad See Charles II (Navarre)

Charles the Bald See Charles II (France)

Charles the Bold (b. Nov. 10, 1433, Dijon, Burgundy [France] — d. Jan. 5, 1477, near Nancy, Lorraine) Last of the great dukes of Burgundy (1467-77). An opponent of Louis XI of France, Charles tried to make Burgundy an independent kingdom. He had great success until 1474, casting off French rule, extending Burgundy's possessions, and building a centralized government. Charles brutally quelled a revolt in Liege (1468) and invaded Normandy (1471). Through negotiation, warfare, and purchases, he sought to extend his territory as far as the Rhine, but a coalition of Swiss, Austrians, and towns on the upper Rhine resisted him. He suffered defeats by the Swiss in 1476 and was killed in battle near Nancy.

Charles the Fair See Charles IV (France)

Charles the Fat See Charles III (Holy Roman Empire)

Charles the Well-Beloved See Charles VI (France)

Charles the Wise See Charles V (France)

Charleston Social jazz dance popular in the 1920s and later, characterized by its toes-in, heels-out twisting steps. Originally a Southern black folk dance, it had parallels in dances of Trinidad, Nigeria, and Ghana. It was popularized by its appearance in the black musical Runnin ' Wild in 1923 and took its name from one of the show's songs, written by James P. Johnson.

Charleston Seaport city (pop., 2000: 96,650), southeastern South Caro-

lina, U.S. Originally called Charles Towne, it was founded by English colonists in 1670. During the American Revolution it was held by the British (1780-82). Known as Charleston from 1783, it was the chief U.S. winter port until the War of 1812. In 1861 the Confederate capture of Fort Sumter in Charleston Harbor precipitated the American Civil War. Blockaded by Union forces, it was under siege (1863-65), then evacuated by Gen. William Tecumseh Sherman's forces. It was seriously damaged by an earthquake in 1886 and a hurricane in 1989. It is the site of the College of Charleston (1770), The Citadel (1842), and the Charleston Museum (1773), the oldest museum in the U.S.

Charleston City (pop., 2000: 53,421), capital of West Virginia, U.S. Situated in the Allegheny Mountains at the confluence of the Elk and Kanawha rivers, it was settled around Fort Lee shortly after the American Revolution. It was the home for a time of Daniel Boone. Divided in allegiance during the American Civil War, it was occupied by Union troops in 1862. It was named the state capital in 1870; the capital was briefly transferred to Wheeling but returned to Charleston in 1885. It is a distribution centre for coal, oil, and gas, and its manufactures include chemicals. Its capitol building (completed 1932) was designed by Cass Gilbert.

Charlotte City (pop., 2000: 540,828), North Carolina, U.S. The Carolinas' biggest metropolis, it lies near the Catawba River, 15 mi (24 km) north of South Carolina. It was settled c. 1748 and named for Charlotte Sophia of Mecklenburg-Streliz (later the wife of George III). In the American Revolution it was occupied by Lord Cornwallis, who dubbed it "the hornet's nest." Until the California gold rush that began in 1848, it was

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the centre of U.S. gold production. In the American Civil War it was the site of a Confederate naval yard. Presidents Andrew Jackson and James Polk were born nearby and received their early schooling there. Its industry includes textiles, machinery, and chemical production, and it is the site of several institutions of higher education.

Charlotte orig. Charlotte Sophia of Mecklenburg-Strelitz (b.

May 19, 1744 — d. Nov. 17, 1818) Queen consort of George III of England. In 1761 she was selected unseen after the British king asked for a review of all eligible German Protestant princesses. The marriage was a success, and the couple had 15 children, including George IV. After the king was declared insane (1811), Parliament turned to the future George IV, while Charlotte was given custody of her husband.

Charlotte Amalie Vshar-lot-o-'mal-yoV City (pop., 2000: 11,004), capital of the island of Saint Thomas and of the U.S. Virgin Islands. Lying on St. Thomas Harbor, it was established as a Danish colony in 1672 and named for the Danish queen (its name was St. Thomas during 1921-36). The largest city in the Virgin Islands, it is built on three low volcanic

spurs. Two castles, attributed to the pirates Blackbeard and Bluebeard, overlook the harbour. Tourism is economically important.

Charlotte Harbor Inlet of the Gulf of Mexico, western coast of Florida, U.S. It is about 25 mi (40 km) long and 5 mi (8 km) wide. It receives the Peace River in the northeast, and a dredged channel serves the port of Punta Gorda. In 1521 Juan Ponce de Leon tried to establish a colony in the area but was driven away by hostile Indians.

Charlottesville City (pop., 2000: 45,049), central Virginia, U.S. Located in the foothills of the Blue Ridge and settled in the 1730s, it grew as a tobacco-trading centre and later was noted as the home of Presidents Thomas Jefferson and James Monroe. In 1781 the British raided Charlottesville in hopes of capturing Jefferson and other leaders of the American Revolution. Sites of interest include Jefferson’s home, Monticello; Monroe’s home, Ash Lawn; and the University of Virginia.

Charlottetown City (pop., 2001: 32,245), capital of Prince Edward Island, Canada. Lying on Hillsborough Bay, it originated in the 1720s as the French settlement Port La Joie. Renamed in honour of the wife of George III after the island passed to Britain in 1763, it became the capital in 1765. Its economy centres on tourism and government business, and, with its excellent harbour, it is the province’s commercial centre. It is the site of Province House, where in 1864 Canada’s unification was first discussed, and the Confederation Center of the Arts, a national memorial to the Fathers of Confederation.

Charlottetown Conference First in a series of meetings in 1864 that led to the formation of the Dominion of Canada in 1867. The conference, held at Charlottetown, Prince Edward Island, was originally called to discuss a union of the three Maritime Provinces. The gathering failed to reach agreement but reconvened in Halifax and later in Quebec, where a constitution for a federal union was drafted, resulting in the British North America Act.

charm In particle physics, the property or internal quantum number that is conserved in strong and electromagnetic interactions, but not in weak interactions (see strong force, electromagnetic force, weak force). Charmed particles contain at least one charmed quark; the charm number of these quarks is +1. Charmed antiquarks (see antimatter) have a charm number of -1. The first charmed particle was discovered in 1974.

Charolais \,shar-9-'la\ Breed of large, light-coloured cattle, developed in France for draft purposes but now kept for beef production and used for crossbreeding. White cattle had long been characteristic of the Charolais region, but the breed was first recognized c. 1775. A typical Charolais is massive, horned, and cream-coloured or slightly darker. The breed was first imported into the U.S. from a Mexican herd in 1936, but, because of problems with disease in the French herds, few were later imported. It is crossbred with beef breeds and dairy cows.

Charon Vkar-on\ In Greek mythology, the son of Erebus (Darkness) and Nyx (Night), whose duty it was to ferry the souls of the dead across the Rivers Styx and Acheron, his payment being the coin placed in the mouth of the corpse before burial. He continues in modern Greek folklore as Charos, or Charontas, the angel of death.

Charophyceae \,kar-3-'fi-se-e\ Class of algae, certain members of

which are commonly known as stoneworts. Stoneworts contain calcium carbonate deposits so extensive that they may form the major part of lake bottoms. Superficially resembling higher plants, stoneworts have rootlike and stemlike structures, as well as whorls of branches at regular intervals. They grow underwater, attached to the muddy bottoms of fresh or brackish rivers and lakes. Except for one form that is sometimes destructive in fish hatcheries, they are of little importance to humans.

Charpentier \shar-pa n -'tya\, Marc-Antoine (b. 1634, Paris, France — d. Feb. 24, 1704, Paris) French composer. He was a student of Giacomo Carissimi in Rome in the 1660s. Back in Paris, he succeeded Jean-Baptiste Lully as music director with Moliere's acting troupe (later the Comedie-Francaise). He became music director at the principal Jesuit church in Paris, and for his last six years he held the prestigious post of maitre de chapelle at the Sainte-Chapelle. Enormously prolific, he was the most important French composer of his generation. He wrote 11 masses, 84 psalm settings, and 207 motets, including some 35 dramatic motets or Latin oratorios, a genre he introduced into France. His works include the oratorio Judicium Salomonis (1702), the mass Assumpta est Maria, and the operas Medee (1693) and David et Jonathas (1688).

Charte Constitutionnelle See Charter of 1814

charter Document granting certain specified rights, powers, privileges, or functions from the sovereign power of a state to a person, corporation, city, or other unit of local organization. In Magna Carta (1215), King John granted certain liberties to the English people. Elsewhere in medieval Europe, monarchs issued charters to towns, guilds, universities, and other institutions, granting the institution certain privileges and sometimes specifying how they should conduct their internal affairs. Later, charters were granted to overseas trading companies (e.g., the British East India Co.), granting them monopolies in certain areas. Britain's colonies in North America were established by charter. Modern charters may be corporate or municipal. A corporate charter, issued by a governmental body, grants individuals the power to form a corporation, or limited-liability company. A municipal charter is a law that creates a new political subdivision and allows the people within it to organize themselves into a municipal corporation, in effect delegating to the people the powers of local self-government.

Charter Oath or Five Articles Oath Oath issued in 1868 by Japan's Meiji emperor. One article, important in spurring the creation of a new legislative body, promised that assemblies would be widely established and that all matters would be "decided by public discussion." Two articles promised an end to feudal class restrictions and "evil customs of the past," and another stated that all classes should work together to "carry out the plan of government." Lastly, it was declared that "knowledge shall be sought throughout the world to promote the welfare of the empire." The Charter Oath set the progressive tone of the Meiji period. See also Meiji Restoration.

Charter of 1814 or Charte Constitutionnelle \ , shart- l ko n -ste-tiE-syo-'nel\ French constitution issued by Louis XVIII after he became king (see Bourbon Restoration). The charter, which was revised in 1830 and remained in effect until 1848, preserved many liberties won by the French Revolution. It established a constitutional monarchy with a bicameral par-

liament, guaranteed civil liberties, proclaimed religious toleration, and acknowledged Catholicism as the state religion.

chartered company Type of corporation that evolved in the 16th century in Europe. Under a charter granted by the state's sovereign authority, the company had certain rights and obligations which usually gave it a trading monopoly in a specific geographic area or for a specific type of trade item. In the 17th century, chartered companies were encouraged by the English, French, and Dutch governments to assist trade and encourage overseas exploration. Those companies that formed for trade with the Indies (see English East India Company; Dutch East India Company; French East India Company) and the New World (see Hudson's Bay Company) had the most wide-reaching influence. Some chartered companies were also involved in the settlement of colonists (see London Company; Plymouth Company). Eventually the development of the modem limited-liability company or corporation led to a decline in the importance of chartered companies.

Chartism British working-class movement for parliamentary reform. It was named after the People's Charter, a bill drafted by William Lovett (1800-1877) in 1838 that demanded universal manhood suffrage, equal electoral districts, vote by ballot, annually elected Parliaments, payment of members of Parliament, and abolition of property qualifications for

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membership. Born amid an economic depression, the movement rose to national importance under the leadership of Feargus O'Connor. Parliament refused to take action on three Chartist petitions presented to it, and the movement declined after 1848.

Chartres Vshart, 'shartrA City (pop., 1999: 40,361), northwestern France. Situated on the Eure River southwest of Paris, it was the capital and centre of Druidic worship for the Carnutes, a Celtic tribe. The Normans attacked and burned the city in 858. In the Middle Ages it was held by the counts of Blois and Champagne. The city was sold to France in 1286 and was occupied by the English from 1417 to 1432. Henry IV was crowned there in 1594. The Germans held it in 1870, and it was severely damaged in World War II. Landmarks include the Gothic Chartres Cathedral.

Chartres Cathedral VshartrA Cathedral of Notre-Dame at Chartres, one of the most influential examples of High Gothic architecture. The main part of this great cathedral was built between 1194 and 1220. It replaced a 12th-century church of which only the crypt, the base of the towers, and the western facade remain. Abandonment of the traditional tribune galleries and the use of a unique type of flying buttress

allowed for a larger clerestory.

Remarkable stained-glass windows and a Renaissance choir screen add to its beauty.

Chase, Salmon P(ortland) (b. Jan. 13, 1808, Cornish Township, N.H., U.S.— d. May 7, 1873, New York, N.Y.) U.S. antislavery leader and sixth chief justice of the U.S. (1864-73). He practiced law in Cincinnati from 1830, defending runaway slaves and white abolitionists. He led the Liberty Party in Ohio from 1841 and helped found the Free Soil Party (1848) and the Republican Party (1854). He served in the U.S. Senate (1849-55, 1860-61) and was the first Republican governor of Ohio (1855-59). He served as secretary of the treasury under Pres. Abraham Lincoln (1861-64). Appointed chief justice of the Supreme Court of the United States by Lincoln, he presided over the impeachment trial of Pres. Andrew Johnson and tried to protect the rights of blacks from infringement by state action.

Chase, Samuel (b. April 17, 1741, Princess Anne, Md. — d. June 19, 1811, Washington, D.C.) U.S. jurist. He was a member of the Maryland assembly (1764-84). An ardent patriot, he helped lead the Sons of Liberty in violent resistance against the Stamp Act. He served on the state Committee of Correspondence (1774), was elected to the Continental Congress, and signed the Declaration of Independence. When Alexander Hamilton exposed his attempt to comer the flour market (1778), Chase retired from Congress, only to return in 1784. He served as chief judge of the Maryland General Court from 1791 to 1796, when Pres. George Washington appointed him to the Supreme Court of the United States. Chase upheld the primacy of U.S. treaties over state statutes in Ware v. Hylton. In Calder v. Bull (1798) he contributed to the definition of due process. At the instigation of Pres. Thomas Jefferson, Chase was impeached for partisan conduct in 1804. His acquittal established the principle that federal judges can be removed only for indictable criminal acts, thus strengthening the independence of the judiciary. Chase served until 1811.

Chase, William Merritt (b. Nov. 1, 1849, Williamsburg, Ind., U.S. — d. Oct. 25, 1916, New York, N.Y) U.S. painter and teacher. He studied in New York and for six years in Munich. Chase became the most important U.S. art teacher of his generation, first at New York’s Art Students League and later at his own school, founded in 1896. His teachings, particularly his advocacy of fresh colour and bravura technique, greatly influenced the course of early 20th-century U.S. painting; among his students were Georgia O'Keeffe and Charles Demuth. As a painter, he was very prolific; his 2,000 paintings include portraits, interiors (e.g., In the Studio, 1880-83), figure studies, still lifes, and landscapes characterized by bold, spontaneous brushwork.

Chase Manhattan Corp. Former U.S. holding company incorporated in 1969 with the Chase Manhattan Bank as its main subsidiary. The bank

The cathedral at Chartres, Fr.

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itself was created in 1955 by the merger of the Bank of Manhattan Co. (founded 1799) and the Chase National Bank (founded 1877). The creation of Chase Manhattan was part of a general movement in U.S. banking to establish holding companies that could bring together banks and financial institutions ordinarily excluded by law from the field of banking. In 1996 it merged with Chemical Banking Corp. (which then owned the nation’s second largest bank) but kept the Chase Manhattan name. A merger with investment bank J.P. Morgan & Co. in 2000 created J.P. Morgan Chase & Co. See also David Rockefeller.

chat Real-time conversation among computer users in a networked environment such as the Internet. After a user types a text message and presses the Enter key, the text immediately appears on the other users’ computers, permitting typed conversations that are often only somewhat slower than normal conversation. A chat can be private (between two users) or public (where other users can see the messages and participate if they wish). Public chatting is conducted in “chat rooms,” Web sites devoted to chat, usually about a specific topic. The thousands of chat rooms now available typically use the IRC (Internet Relay Chat) protocol, developed in 1988 by Jarkko Oikarinen of Finland. See also bulletin-board system.

chat Any of several species of songbird named for their harsh, chattering notes. True chats (chat-thrushes) make up a major division of the thrush family (Turdidae). Australian chats (usually placed in the family Maluridae), which inhabit scrubby open lands, are about 5 in. (13 cm) long. The yellow-breasted chat (Icteria virens, family Parulidae) of North America is the largest wood warbler (7.5 in., or 19 cm, long). Greenish gray above and bright yellow below, with white “spectacles,” it hides in thickets but may perch in the open to utter its mewing, churring, and whistling sounds. See also redstart.

Yellow-breasted chat (Icteria virens)

RON AUSTING-BRUCE COLEMAN INC.

Chateaubriand \sha-to-bre-'a n \, viscount of (b. Sept. 4, 1768, Saint-Malo, France — d. July 4, 1848,

Paris) French author and statesman. A cavalry officer at the start of the French Revolution, he refused to join the Royalists and instead sailed to the U.S., where he traveled with fur traders. On Louis XVI’ s fall he returned to join the Royalist army. A tala (1801), part of an unfinished epic, drew on his travels in the U.S. The Genius of Christianity (1802), which asserted the value of Christianity on the basis of its poetic and artistic appeal, influenced many Romantic writers and brought him briefly into favour with Napoleon. With the 1814 Restoration he became a major political figure. Other works include the novel Rene (1805) and his memoirs (6 vol., 1849-50), perhaps his most lasting monument. He was the preeminent French writer of his day.

(Francois-Auguste-) Rene,

Viscount de Chateaubriand, detail of an oil painting by Girodet-Trioson; in the National Museum of Versailles and the Trianons, France.

CLICHE MUSEES NATIONAUX

Chateauguay \'sha-t3-ge\, Battle of (Oct. 26, 1813) Engagement in the War of 1812, in which the British compelled a U.S. force to abandon an attack on Montreal. An advance unit of 1,500 men from an invading U.S. force of about 4,000 troops under Wade Hampton was stopped at Chateauguay, Que., by British troops (most of them French Canadians) who occupied the woods along the riverbank. The battle was followed by the withdrawal of the U.S. force from Canada.

Chatham, Earl of See William Pin, the Elder

Chatham Strait Vchat- 3 m\ Narrow passage, North Pacific Ocean. Extending off southeastern Alaska 150 mi (240 km) between the Admi-

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ralty and Kuiu islands on the east and the Chicagof and Baranof islands on the west, it is 3-10 mi (5-16 km) wide. It forms part of the Inside Passage between Alaska and Washington state.

Chattahoochee River \ 1 cha-t3- , hii-che\ River, southeastern U.S. Rising in northeastern Georgia, it flows southwest to the Alabama border and then south, forming a section of the Alabama-Georgia and Georgia-Florida boundaries, to join the Flint River at Chattahoochee, Fla., after a course of about 436 mi (702 km). Dammed at the Georgia-Florida border, it forms Lake Seminole, below which the river is known as the Apalachicola River.

Chattanooga City (pop., 2000: 155,554) and port of entry, southeastern Tennessee, U.S. Lying on the Tennessee River between Missionary Ridge to the east and Lookout Mountain to the southwest, it was established as a trading post (Ross’s Landing) in 1815. Renamed Chattanooga in 1838, it developed as a river port. A strategic Confederate communications point in the American Civil War, it was a major objective of the Union armies, with fighting culminating in the Battles of Chickamauga and Chattanooga (1863).

Chattanooga, Battle of (Nov. 23-25, 1863) Decisive engagement of the American Civil War. The battle was fought at Chattanooga, Tenn., a vital railroad junction. A Confederate army under Braxton Bragg besieged a Union army in September 1863, and to lift the siege, Union troops under Ulysses S. Grant marched on Bragg’s troops. At battles on Lookout Mountain and Missionary Ridge, the Union troops forced the Confederate army to retreat. With this victory, the North was poised to split the South horizontally by marching across Georgia to the sea. See also Battle of Chickamauga.

Chatterjee \'chat-or-je\, Bankim Chandra orig. Bankim Chandra Cattopadhyay (b. June 26/27, 1838, near Naihati, Bengal, India — d. April 8, 1894, Calcutta) Indian novelist. Chatterjee was educated in Calcutta (now Kolkata) and served as a deputy magistrate in civil service for many years. His first notable Bengali work was Daughter of the Lord of the Fort (1865). His epoch-making newspaper, Bangadarsan, serialized some of his later works. Though his novels were considered structurally faulty, his contemporaries saw him as a prophet, and his valiant Hindu heroes aroused great pride and patriotism. He helped create the Indian school of fiction and established Bengali prose as a literary language. Chatterjee is considered the greatest Bengali novelist.

Chatterton, Thomas (b. Nov. 20, 1752, Bristol, Gloucestershire, Eng. — d. Aug. 24, 1770, London) English poet. At age 11 Chatterton wrote a pastoral eclogue on an old parchment and passed it off successfully as a 15th-century work. Thereafter he created more poems in a similar vein, attributing them to a fictitious monk he called Thomas Rowley. After a mock suicide threat freed him from an apprenticeship to an attorney, he set out for London. There he had some success with a comic opera, The Revenge, but when a prospective patron died, he found himself penniless and without prospects and committed suicide at 17. Considered a precursor of Romanticism, he was praised by such poets as Samuel Taylor

Coleridge, John Keats, Lord Byron, and William Wordsworth.

Chaucer Vcho-ssrX, Geoffrey (b. c. 1342/43, London?, Eng. — d. Oct. 25, 1400, London) English poet. Of middle-class birth, he was a courtier, diplomat, and civil servant, trusted by three kings in his active and varied career, and a poet only by avocation. His first important poem. Book of the Duchesse (1369/70), was a dream vision elegy for the duchess of Lancaster. In the 1380s he produced mature works, including The Parliament of Fowls, a dream vision for St. Valentine's Day about a conference of birds choosing their mates; the fine tragic verse romance Troilus and Criseyde; and the unfinished dream vision Legend of Good Women. His best-known work, the unfinished Canterbury Tales (written 1387-1400), is an intricate dramatic narrative that employs a pilgrimage to the shrine of St. Thomas Becket in Canterbury as a framing device for a highly varied collection of stories; not only the most famous literary work in Middle English, it is one of the finest works of English literature. In this and other works Chaucer established the southern English dialect as England's literary language, and he is regarded as the first great English poet.

Chaumette \sho-'met\, Pierre-Gaspard (b. May 24, 1763, Nevers, France — d. April 13, 1794, Paris) French Revolutionary leader. In 1791 he signed the petition that demanded the abdication of Louis XVI. As procurator-general of the Paris Commune from 1792, he instituted such social reforms as improved hospital conditions. Strenuously anti-Catholic

and a misogynist, he promoted the anti-Christian cult of the goddess Reason and banned women's participation in political demonstrations. He was executed during the Reign of Terror because of his democratic extremism.

Chaumont \sho-'mo n \, Treaty of (1814) Treaty signed by Austria, Prussia, Russia, and Britain binding them to defeat Napoleon. The British foreign secretary Viscount Castlereagh played a leading part in negotiating the treaty, by which the signatories undertook not to negotiate separately, and promised to continue the struggle until Napoleon was overthrown. The treaty tightened allied unity and made provision for a durable European settlement.

Chauncy, Charles (b. Jan. 1, 1705, Boston, Mass. — d. Feb. 10, 1787, Boston, Mass., U.S.) American clergyman. He served as minister of the First Church of Boston from 1727 until his death. He opposed the establishment of an Anglican bishopric in the American colonies. He is best known as a leading critic of the Great Awakening. He also wrote books, pamphlets, and sermons espousing the cause of the American Revolution.

Chausson \sho-'so n \, (Amedee-) Ernest (b. Jan. 21, 1855, Paris, France — d. June 10, 1899, Limay) French composer. He studied with Jules Massenet and Cesar Franck. Having a comfortable income, he kept a notable artistic salon in Paris and had no need for regular employment. His most important works are the orchestral song cycle Poeme de l 'amour et de la mer (1893), the incidental music to La Legende de Sainte Cecile (1891), a symphony (1890), the opera Le Roi Arthus (1895), and Poeme for violin and orchestra (1896). He died in a cycling accident.

Chautauqua \sh3-'t6-kw9\ movement Popular U.S. educational and cultural movement founded in 1874. It began as a training assembly for Sunday-school teachers at Chautauqua Lake, N.Y., but gradually spread to various circuit "chautauquas" and broadened in scope to include gen-

eral education and popular entertainments, many of which incorporated religious themes. Outstanding speakers were brought in for summer lectures and classes. The movement declined after reaching a peak in 1924 (though the Chautauqua Institution still holds meetings), but its legacy contributed to the growth of community colleges and continuing education programs. See also Lyceum movement.

Chautemps \sho-'ta n \, Camille (b. Feb. 1, 1885, Paris, France — d. July 1, 1963, Washington, D.C., U.S.) French politician. A Radical Socialist, he was elected to the Chamber of Deputies in 1919. He served in several cabinet posts and as premier of France in 1930, 1933-34, and 1937—38. As a cabinet member in 1940, he was among the first to suggest the surrender of France to Nazi Germany. He held a ministry in the Vichy government (see Vichy France) but broke with Philippe Petain's government after arriving in the U.S. on an official mission. He lived in the U.S. for much of the rest of his life. After World War II a French court convicted him in absentia for collaborating with the enemy.

Chavannes, Pierre Puvis de See Pierre Puvis de Chavannes

Chavez \'cha-,vez\ (y Ramirez), Carlos (Antonio de Padua)

(b. June 13, 1899, Mexico City, Mex. — d. Aug. 2, 1978, Mexico City) Mexican composer and conductor. Trained as a pianist, he was largely self-taught as a composer. When Mexico's first permanent symphony orchestra was formed in 1928, he became its director; he held the post for 20 years, touring widely and conducting many premiere performances. As director of the National Conservatory (1928-34), he reformed the curriculum and organized several concert series. He was Mexico's most prominent and honoured musician of the 20th century. His works, notable for their rhythmic vitality and orchestral colour, include seven symphonies; Sinfonia de Antigona (1933) and Sinfonia India (1936), both one-movement works on Mexican Indian themes; the highly percussive Concerto No. 1 for Piano and Orchestra (1940); and Xochipilli Macuilxochitl (1940) for orchestra with Indian instruments.

Chavez Vcha-vas,\ English Vchav-.ezV, Cesar (Estrada) (b. March 31, 1927, Yuma, Ariz., U.S. — d. April 23, 1993, San Luis, Ariz.) U.S. organizer and leader of migrant farmworkers. As the child of Mexican American migrant labourers, he spent his early years in a succession of migrant camps, attending school only sporadically. He spent two years in the Navy and had returned to migrant farmwork when, in 1962, he began organizing the largely Hispanic farmworkers of Arizona and California. A charismatic figure, he used strikes and nationwide boycotts to win union recognition and contracts from California grape and lettuce growers. He brought his union into the AFL-CIO, and in 1971 it became the United Farm Workers of America (UFW). He successfully battled the Teamsters

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Union for the right to organize field hands in the 1970s, but in later years

his leadership faltered and the UFW declined. In recognition of his non-violent activism and support of working people, Chavez was awarded the Presidential Medal of Freedom posthumously in 1994.

Chavin de Huantar \cha-'ven-tha-'wan-tar\ Site of temple ruins, west-central Peru. The ruins belong to the Chavin pre-Columbian culture, which flourished c. 900-c. 200 bc. The central building is a massive temple complex constructed of rectangular stone blocks; it contains interior galleries and incorporates bas-relief carvings on pillars and lintels.

Chayefsky \cha-'yef-ske\, Paddy orig. Sidney Chayefsky (b.

Jan. 29, 1923, New York, N.Y., U.S. — d. Aug. 1, 1981, New York City) U.S. playwright. He wrote his first full-length television play in 1952, and his work became prominent in the early flowering of television drama. Known for chronicling the lives of ordinary people, he had his greatest television and film success with Marty (1955, Academy Award). The Catered Affair (1956) and The Bachelor Party (1957) were also well received. His stage plays include The Tenth Man (1959), Gideon (1961), and The Latent Heterosexual (1968). He returned to screenwriting with The Hospital (1971, Academy Award) and Network (1976, Academy Award).

chayote \chI-'yo-te\ Tendril-bearing perennial vine (Sechium edule) of the gourd family, native to the New World tropics, where it is widely cultivated for its edible fruits. Chayote also is grown as an annual plant in temperate climates. The fast-growing vine bears small, white flowers and green or white pear-shaped fruits with furrows. Each fruit contains one seed. The fruits are eaten cooked or raw, and the young root tubers are prepared like potatoes.

Che-chiang See Zhejiang

Chechnya \chech-'nya, 'chech-nyo\ Republic, southwestern Russia.

Part of the Chechen-Ingush autonomous republic of the former U.S.S.R., it became a republic within Russia in 1992, as did Ingushetia. It is populated mainly by Chechens, a Muslim ethnolinguistic group. Chechnya’s demand for independence from Russia in 1992 led to an invasion by Russian troops in 1994. Fighting led to severe devastation of the area, and a series of cease-fires were negotiated and violated. A provisional peace treaty was signed in May 1997, and Russian troops withdrew but returned in 1999; heavy fighting resumed. In 2003 a new constitution was approved that devolved greater powers to the Chechen government but kept the republic in the federation. The capital, Grozny (pop., 2002 est.: 223,000), a major oil centre with pipelines to the Caspian and Black seas, received heavy damage in the fighting.

check Bill of exchange drawn on a bank and payable on demand. Checks have become the chief form of money in the domestic commerce of developed countries. As a written order to pay money, a check may be transferred from one person to another by endorsement. Most checks are not

paid in currency but by the debiting and crediting of bank deposits. There are several special forms of checks. A cashier’s check is issued by a bank and has unquestioned acceptability, as does a certified check, which is a depositor’s check that has been guaranteed by a bank. Traveler’s checks are cashier’s checks sold to travelers, which must be signed twice by the payee, once when the check is issued and once when it is cashed; reimbursement is guaranteed if they are lost or stolen.

checkers or draughts Board game for two players, each with 12 pieces positioned on the black squares of a 64-square checkerboard. Play consists of advancing a piece diagonally forward to an adjoining square, the goal being to jump and thus capture each of an opponent’s pieces until all are removed and victory is declared. When a piece reaches the final (king) row, it is crowned with a piece of the same colour and can begin to move in any direction. Similar games have been played in various cultures and in times extending back to antiquity.

checks and balances Principle of government under which separate branches are empowered to prevent actions by other branches and are induced to share power. Checks and balances are applied primarily in constitutional governments. They are of fundamental importance in tripartite governments, such as that of the U.S., that separate powers among legislative, executive, and judicial departments. Checks and balances, which modify the separation of powers, may operate under parliamentary systems through exercise of a parliament’s prerogative to adopt a no-confidence vote against a government; the government, or cabinet, in turn, ordinarily may dissolve the parliament. In one-party political systems, informal checks and balances may operate when organs of an authoritarian or totalitarian regime compete for power. See also Federalist papers; judicial review; separation of powers.

cheese Food consisting of the coagulated, compressed, and usually ripened curd of milk separated from the whey. When milk sours, it forms both a protein-rich gel, or curd, and a lactose-rich fluid, or whey. Coagulation is often facilitated by adding rennin, an enzyme that acts on the milk’s chief protein, casein. The resulting curd is then cut or broken to release most of the whey. Ripening and curing are affected by moisture content, acidity, presence of microorganisms, and other factors. Cheese is made from the milk of cows, goats, sheep, water buffalo, llamas, yaks, and other animals; in the West, cow’s milk is most common. Products vary according to fat content of the milk, heating or pasteurization, and addition of enzymes or cultures of bacteria, molds, or yeasts. Cheese varieties include hard cheeses (e.g., cheddar, Edam, Emmental, Gouda, Provolone, Romano, Swiss), semisoft cheeses (Gorgonzola, Limburger, Muenster, Roquefort), and soft cheeses (Brie, Camembert, cottage, Neufchatel, and ricotta). Cheese is a source of protein, fat, minerals (calcium, phosphorus, sulfur, iron), and vitamin A.

cheetah Slender, long-legged cat (Acinonyx jubatus) that lives on open plains of southern, central, and eastern Africa, and in the Middle East, where it is all but extinct. The fastest land animal in the world over short distances, it can reach a speed as great as 71 mph (114 kph). Its claws differ from those of other cats in being only partly retractable and in lacking protective sheaths. Like cats in the genus Felis, cheetahs purr rather than roar. The cheetah grows to about 55 in. (140 cm) long, excluding the 29-31-in. (75-80-cm) tail, and weighs 75-119 lbs (34-54 kg). The adult’s

coarse fur is sandy yellow above, white below, and covered with small black spots; a black streak runs down the face from the corner of each eye. The cheetah hunts by day, alone or in small groups.

Cheever, John (b. May 27, 1912, Quincy, Mass., U.S. — d. June 18, 1982, Ossining, N.Y.) U.S. short-story writer and novelist. Cheever lived principally in southern Connecticut. His stories appeared notably in The New Yorker , his clear and elegant prose delineating the drama and sadness of life in comfortable suburban America, often through fantasy and ironic comedy. He has been called the Chekhov of the suburbs. His collections include The Enormous Radio (1953), The Brigadier and the Golf Widow (1964), and The Stories of John Cheever (1978, Pulitzer Prize). Among his novels are The Wapshot Chronicle (1957), The Wapshot Scandal (1964), and Falconer (1977). His revealing journals were published in 1991. Two of his children, Susan and Benjamin, also became writers.

Cheke Vchek\, Sir John (b. June 16, 1514 — d. Sept. 13, 1557, London, Eng.) English humanist. A supporter of the Reformation, he was named professor of Greek at Cambridge University by Henry VIII and knighted by Edward VI. With his friend, the statesman Thomas Smith (1513-77), he ably defended the historical pronunciation of Attic Greek, introduced by Erasmus, in opposition to the post-
Classical pronunciation that was then
the norm. Cheke was imprisoned
briefly on the accession of Mary I; he
fled abroad but was captured in the
Netherlands in 1556 and confined to
the Tower of London. He recanted
Protestantism to avoid execution and
died the following year, allegedly
depressed by his forced abjuration.

Chekhov Vchek-ofA English
\'chek-of\, Anton (Pavlovich)

(b. Jan. 29, 1860, Taganrog,

Russia — d. July 14/15, 1904, Baden-
weiler, Ger.) Russian playwright and
short-story writer. The son of a
former serf, he supported his family
by writing popular comic sketches Anton Chekhov, 1 902.
while studying medicine in Moscow, david magarshack

Chayote (Sechium edule)

EUGENE BELT-SHOSTAL

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While practicing as a doctor, he had his first full-length play, Ivanov (1887), produced, but it was not well-received. He took up serious themes with stories such as “The Steppe” (1888) and “A Dreary Story” (1889); later stories include “The Black Monk” (1894) and “Peasants” (1897). He converted his second long play, The Wood Demon (1889), into the masterpiece Uncle Vanya (1897). His play The Seagull (1896) was badly received until its successful revival in 1899 by Konstantin Stanislavsky and the Moscow Art Theatre. He moved to the Crimea to nurse his eventually fatal tuberculosis, and there he wrote his great last plays. Three Sisters (1901) and The Cherry Orchard (1904), for the Moscow Art Theatre. Chekhov’s plays, which take a tragicomic view of the staleness of provincial life and the passing of the Russian gentry, received international acclaim after their translation into English and other languages, and as a short-story writer he is still regarded as virtually unmatched.

Chekiang See Zhejiang

chelate Vke-,lat\ Any of a class of coordination or complex compounds consisting of a central atom of a metal (usually a transition element) attached to a large molecule (ligand). Any ligand that can bind to the metal at two or more points to form a ring structure, more stable than a nonchelated compound of the same general chemical formula, is a chelating agent. The process of binding to the metal is called chelation. Chelating agents such as EDTA salts are used in medicine to remove toxic metals (e.g., lead, cadmium) from the body. Others are used in analysis as indicators and in industry to extract metals. The iron-binding porphyrin group in hemoglobin, the magnesium-binding porphyrin in chlorophyll, and the cobalt-binding porphyrin in vitamin B 12 are natural chelators.

Chelif \sha-'lef\ River River, Algeria. Rising in the Atlas Mountains, it flows north and west into the Mediterranean Sea east of the city of Oran. At 422 mi (679 km) in length, it is Algeria’s longest river, though it is mostly unnavigable and has an irregular flow.

Chelmsford Vchelmz-fordV Town and borough (pop., 2001: 157,053), county seat of Essex, southeastern England. It lies on the northeastern periphery of Greater London. There are remains of the Roman settlement of Caesaromagus. In 1227 Chelmsford became the regular seat of the county judicial gatherings known as assizes. The world’s first wireless telegraph service was transmitted in 1920 from the local premises of Guglielmo Marconi’s company. Light engineering, especially electronics, is important to the economy.

Chelmsford (of Chelmsford),

Frederic John Napier Thesiger, 1 st Viscount (b. Aug.

12, 1868, London, Eng. — d. April 1,

1933, London) English colonial administrator. In 1905 he was appointed governor of Queensland, Austl., and in 1909 of New South Wales. He left Australia in 1913 to serve in India as a captain in the Dorsetshire regiment. As viceroy of India in a time of surging Indian nationalism (1916-21), he helped to institute reforms increasing Indian representation in government but provoked opposition by his severe measures against nationalists.

Chelsea porcelain Soft-paste porcelain made in the London borough of Chelsea. The factory, established c. 1743, produced its greatest wares — tableware and bird figures, with designs inspired by Meissen porcelain and marked with a raised anchor on an oval medallion — from 1750 to 1752. Later marks used were the red anchor (1752-58) and the gold anchor (1758-70). Production from 1770 to 1784, when the factory was maintained by William Duesbury of Derby, is known as Chelsea-Derbyware. Reproductions and forgeries are numerous. See photograph opposite.

Chelyabinsk \chel-'ya-b3nsk\ City (pop., 2002: 1,078,300), west-central Russia. Located 125 mi (200 km) southeast of Yekaterinburg on the Trans-Siberian Railroad, it is the capital of Chelyabinsk oblast. Founded as a frontier outpost on the site of a Bashkir village in 1736, its growth was greatly stimulated by the eastward evacuation of Russian industry in World War II.

chemical dependency See drug addiction
chemical element See element, chemical

chemical energy Energy stored in the bonds of chemical compounds. Chemical energy may be released during a chemical reaction, often in the form of heat; such reactions are called exothermic. Reactions that require an input of heat to proceed may store some of that energy as chemical energy in newly formed bonds. The chemical energy in food is converted by the body into mechanical energy and heat. The chemical energy in coal is converted into electrical energy at a power plant. The chemical energy in a battery can also supply electrical power by means of electrolysis.

chemical engineering Academic discipline and industrial activity concerned with developing processes and designing and operating plants to change materials' physical or chemical states. With roots in the inorganic and coal-based chemical industries of western Europe and the oil-refining industry in North America, it was spurred by the need to supply chemicals and products during the two World Wars. The field includes research, design, construction, operation, sales, and management activities. Chemical engineers must master chemistry (including the nature of chemical reactions, the effects of temperature and pressure on equilibrium, and the effects of catalysts on reaction rates), physics, and mathematics. The engineering aspect, involving fluid flow (see deformation and flow) and heat and mass transfer, is broken down into "unit operations," including vaporization, distillation, absorption, filtration, extraction, crystallization, agitation and mixing, drying, and size reduction; each is described mathematically, and its principles apply to any material. Chemical engineers work not only in the chemical and oil industries but also in such processing industries as foods, paper, textiles, plastics, nuclear, and biotechnology.

chemical equation Method of writing the essential features of a chemical reaction using chemical symbols (or other agreed-upon abbreviations). By convention, reactants (present at the start) are on the left, products (present at the end) on the right. A single arrow between them denotes an irreversible reaction, a double arrow a reversible reaction. The law of conservation of matter (see conservation law) requires that every atom on the left appear on the right (the equation must balance); only their arrangements and combinations change. For example, one oxygen molecule combining with two hydrogen molecules to form two water molecules is written 2H 2 + 0 2 — » 2H 2 0. The dissociation of salt into sodium and chloride ions is written NaCl — > Na + + Cl - . See also stoichiometry.

chemical formula Expression of the composition or structure of a chemical compound. Formulas for MOLECULES USe CHEMICAL SYMBOLS with subscript numbers to show the number of atoms of each element: 0 2 for molecular oxygen, 0 3 for ozone, CH 4 for methane, C 6 H 6 for benzene. Parentheses may enclose atoms that act as a group. General formulas show the proportions of atoms in members of a class (e.g., C„H 2 „ + 2 for alkanes). If the substance does not exist as molecules (see ionic bond), empirical formulas show the relative proportions of the constituents (e.g., NaCl for sodium chloride). Structural formulas show bonds (see bonding) between atoms in a molecule as short lines between symbols; they are particularly useful for showing how isomers differ. A projection formula also indicates the three-dimensional arrangement of the atoms (see Fischer projection; stereochemistry).

chemical hydrology or hydrochemistry Subdivision of hydrology that deals with the chemical characteristics of the water on and beneath the surface of the Earth. Water in all forms is affected chemically by the materials with which it

Cathedral of Saint Mary, Chelmsford, England.

THE J. ALLAN CASH PHOTOUBRARY

Chelsea soft-paste porcelain vase in the French Rococo style of Sevres ware with "mazarin blue" ground and a "reserve" panel painting by John Donaldson (after Francois Boucher), gold anchor mark, c. 1 763; in the Victoria and Albert Museum, London.

COURTESY OF THE VICTORIA AND ALBERT MUSEUM, LONDON

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comes into contact, and it can dissolve many elements in significant quantities. Chemical hydrology is concerned with the processes involved and thus includes study of phenomena such as the transport of salts from land to sea (by erosion of rocks and surface runoff) and from sea to land (by evaporation, cloud formation, and precipitation) and the age and origin of groundwater in desert regions and of ice sheets and glaciers.

chemical reaction Any chemical process in which substances are changed into different ones, with different properties, as distinct from changing position or form (phase). Chemical reactions involve the rupture or rearrangement of the bonds holding atoms together (see bonding), never atomic nuclei. The total mass and number of atoms of all reactants equals those of all products, and energy is almost always consumed or liberated (see heat of reaction). The speed of reactions varies (see reaction rate). Understanding their mechanisms lets chemists alter reaction conditions to optimize the rate or the amount of a given product; the reversibility of the reaction and the presence of competing reactions and intermediate products complicate these studies. Reactions can be syntheses, decompositions, or rearrangements, or they can be additions, eliminations, or substitutions. Examples include oxidation-reduction, polymerization, ionization (see ion), combustion (burning), hydrolysis, and acid-base reactions.

chemical symbol Notation of one or two letters derived from the scientific names of the chemical elements (e.g., S for sulfur, Cl for chlorine, Zn for zinc). Some hark back to Latin names: Au (durum) for gold, Pb (plumbum) for lead. Others are named for people or places (e.g. einsteinium, Es, for Einstein). The present symbols express the system set out by the atomic theory of matter. John Dalton first used symbols to designate single atoms of elements, not indefinite amounts, and Jons Jacob Berzelius gave many of the current names. Chemical formulas of compounds are written as combinations of the elements’ symbols, with numbers indicating their atomic proportions, using various conventions for ordering and grouping. Thus, sodium chloride is written as NaCl and sulfuric acid as H_2SO_4.

chemical warfare Use of lethal or incapacitating chemical weapons

in war, and the methods of combating such agents. Chemical weapons include choking agents such as the chlorine and phosgene gas employed first by the Germans and later by the Allies in World War I; blood agents such as hydrogen cyanide or cyanogen gas, which block red blood cells from taking up oxygen; blister agents such as sulfur gas and Lewisite, also dispensed as a gas, which burn and blister the skin; and nerve agents such as Tabun, Sarin, Soman, and VX, which block the transmission of nerve impulses to the muscles, heart, and diaphragm. The horrific casualties suffered in World War I led to the 1925 Geneva Protocol, which made it illegal to employ chemical weapons but did not ban their production. Chemical weapons were used a number of times afterward, most notably by Italy in Ethiopia (1935-36), by Japan in China (1938^-2), by Egypt in Yemen (1966-67), and by Iran and Iraq against each other (1984-88). During the Cold War the Soviet Union and U.S. built up enormous chemical arsenals; these were dismantled under the terms of the 1993 Chemical Weapons Convention, which prohibits all development, production, acquisition, stockpiling, or transfer of such weapons. Not all countries have signed the convention, and many are suspected of pursuing clandestine chemical programs. Many military forces have adopted various defensive measures, including chemical sensors, protective garments and gas masks, decontaminants, and injectable antidotes, and some have reserved the option of retaliating in kind to any chemical attack. In 1995 a religious cult killed 12 civilians and injured thousands more with Sarin gas in Tokyo; this pointed out the power of chemical agents as weapons of terror as well as the difficulty of protecting civilian populations. See also biological warfare.

chemin de fer Vsha-.man-do-'ferV or shimmy Card game in which two or three cards are dealt to up to 12 players, who bet one at a time against each other rather than against the house. The winning hand is the one that comes closer to but does not exceed a count of 9. The game (whose French name means “railroad”) derives from baccarat and has similar rules.

chemistry Science that deals with the properties, composition, and structure of substances (elements and compounds), the reactions and transformations they undergo, and the energy released or absorbed during those processes. Often called the “central science,” chemistry is concerned with atoms as building blocks (rather than with the subatomic domain; see nuclear physics, quantum mechanics), with everything in the material world,

and with all living things. Branches of chemistry include inorganic (see inorganic compound), organic (see organic compound), physical, and analytical (see analysis) chemistry; biochemistry; electrochemistry; and geochemistry. Chemical engineering (applied chemistry) uses the theoretical and experimental information obtained in chemistry to build chemical plants and make useful products.

Chemnitz \'kem-nits\ formerly (1953-90) Karl-Marx-Stadt \ l karl- , marks-,shtat\ City (pop., 2002 est.: 255,800), eastern Germany. It lies along the Chemnitz River southeast of Leipzig. Chemnitz began as a trading place on a salt route to Prague and was chartered in 1143. Germany’s first spinning mill was operating there in 1800, and the first German locomotive was built there. The city remains an industrial centre.

chemoreception \ l ke-mo-ri- , sep-sh9n\ Sensory process by which organisms respond to external chemical stimuli, by employing special-

ized cells (chemoreceptors) that convert the stimuli directly or indirectly into nerve impulses. Chemoreceptors that are components of sensory neurons that directly convert chemical stimuli are called primary receptors. Secondary receptors are not part of neurons but respond to stimulation by inducing activity in an adjacent neuron. Most mammals possess two classes of chemoreceptors: the primary receptors involved in smell and located in the epithelium of the nasal cavity and the secondary receptors involved in taste and located in the tongue's taste buds. Aquatic animals and terrestrial species with mucus-secreting skins typically possess chemoreceptors all over the body. For many animals, chemoreception is the most important means of receiving information about their surrounding environment. Chemoreception plays roles in finding appropriate food and in reproductive behaviour (see pheromones). It serves additional purposes in some animals, such as distinguishing members of the same community from outsiders.

chemotaxonomy V.ke-mo-tak-'sa-no-meV Method of biological classification based on similarities in the structure of certain compounds among the organisms being classified. Advocates argue that, because proteins are more closely controlled by genes and less subject to natural selection than are anatomical features, they are more reliable indicators of genetic relationships.

chemotherapy V.ke-mo-'ther-o-peV Treatment of diseases, including cancer, with chemicals. Some cancer drugs interfere with cancer-cell division or enzyme processes. However, they have serious side effects, attacking some healthy cells and reducing resistance to infection. Certain steroids are used to treat breast cancer and prostate cancer, leukemia, and lymphomas. Derivatives of plants such as periwinkle (vincristine, vinblastine) and yew (taxol) have been found effective against Hodgkin disease, leukemia, and breast cancer.

Chen Duxiu Vchon-'dU-she-'iA or Ch'en Tu-hsiu (b. Oct. 8, 1879, Huaining county, Anhuei province, China — d. May 27, 1942, Jiangjing, near Chongqing) Chinese political and intellectual leader, cofounder of the Chinese Communist Party. As a young man, Chen studied in Japan. In China, he started subversive periodicals that were quickly suppressed by the government. In 1915, after the establishment of the Chinese republic, he created the monthly Qingnian zazhi ("Youth Magazine"), renamed Xin qingnian ("New Youth"), in which he proposed that the youth of China rejuvenate the nation intellectually and culturally; Lu Xun, Hu Shih, and Mao Zedong were all contributors. In 1917 Chen was appointed dean of the School of Letters at Beijing University. In 1919 he was imprisoned briefly for his role in the May Fourth Movement; on his release he became a Marxist. With Li Dazhao he founded the Chinese Communist Party in 1920; he is regarded as "China's Lenin." The Communist International had him removed as party leader when the party's alliance with the Nationalist Party fell apart, and he was expelled from the party in 1929. Arrested in 1932, he spent five years in prison.

Chen Shui-bian (b. Feb. 18, 1951, Tainan county, Taiwan) President of the Republic of China (Taiwan) from 2000. Chen studied law at National Taiwan University and later became one of the island's leading attorneys. After unsuccessfully defending protesters who opposed the ruling Nationalist Party, he became linked with the opposition movement, and in the mid-1980s he was jailed on charges of libeling a Nationalist official. He subsequently joined the Democratic Progressive Party and became a prominent member of the movement to establish Taiwan's inde-

pendence. He served in Taiwan’s legislature (1989-94) before being elected mayor of Taipei in 1994. Although he did not win reelection in 1998, the loss freed him to run for president in 2000, and he defeated the

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Nationalist Party’s candidate, ending that party’s 55-year rule of Taiwan. In 2004 Chen was narrowly reelected, the vote coming one day after he and his running mate. Vice President Annette Lu (Lu Hsiu-lien), were shot and slightly wounded while campaigning in Tainan.

Chenab \ch3-'nab\ River ancient Acesines River, India and Pakistan. Rising in Himachal Pradesh state in the Indian Himalayas, it flows west through southern Jammu and Kashmir state and central Punjab province, Pakistan, to unite with the Jhelum and then flow into the Sutlej, a major tributary of the Indus River. One of the “five rivers” of the Punjab, it is about 600 mi (965 km) long and the source of an extensive canal and irrigation system.

Cheney, Dick in full Richard Bruce Cheney (b. Jan. 30, 1941, Lincoln, Neb., U.S.) U.S. politician, vice president of the U.S. from 2001. Cheney grew up in Casper, Wyo., and received bachelor’s and master’s degrees from the University of Wyoming. He became a deputy assistant to Pres. Gerald Ford in 1974 and served as his chief of staff from 1975 to 1977. In 1978 Cheney was elected from Wyoming to a Republican seat in the U.S. House of Representatives; he served six terms. As secretary of defense (1989-93) in the administration of Pres. George Bush, he presided over reductions in the military following the breakup of the Soviet Union. Following Bush’s electoral defeat in 1992, Cheney became a fellow at the American Enterprise Institute, a conservative think tank, and later chairman and chief executive officer of the Halliburton Company, a supplier of technology and services to the oil and gas industries. He was elected vice president on a ticket with George W. Bush in 2000 and 2004.

Cheng Ch'eng-kung See Zheng Chenggong
Cheng-chou See Zhengzhou

Cheng Hao and Cheng Yi or Ch'eng Hao and Ch'eng I

\ , choi]- , haLi... , ch3r)- , e\ (respectively b. 1032, Henan, China — d. 1085, Henan; b. 1033, Henan — d. 1107, Henan) Brothers who developed Neo-Confucianism into an organized philosophical school. Cheng Hao studied Buddhism, Daoism, and then Confucianism. He was dismissed from Chinese government service for opposing the reforms of Wang Anshi, and he joined his brother in Henan, where they gathered a circle of disciples. Cheng Yi’s stem morality led him to decline high office and criticize those in power. He was twice censured and pardoned. The brothers built their philosophies on the concept of li (basic truths), but Cheng Hao stressed calm introspection while Cheng Yi stressed investigation of the myriad things of the universe and participation in human affairs. Cheng Hao’s

idealism was continued by Lu Xiangshan and Wang Yangming, and Cheng Yi's realism was developed by Zhu Xi.

Cheng Ho See Zheng He
Cheng-hsien See Zhengzhou

Ch'eng-tsung See Dorgon

Cheng-Zhu school or Ch'eng-Chu school Vchorp'jiA Chinese school of Neo-Confucianism. Its leading philosophers were Cheng Yi (see Cheng Hao and Cheng Yi) and Zhu Xi, for whom the school is named. Cheng Yi taught that to understand li (basic truths), one should investigate all things in the world through induction, deduction, historical study, or political activity. Zhu Xi maintained that rational investigation was central to moral cultivation. The school dominated Chinese philosophy until the Republican Revolution (1911).

Chengdu Vchorj-'duX or Ch'eng-tu City (pop., 1999 est.: 2,146,126), capital of Sichuan province, China. It lies in the fertile Chengdu plain, the site of one of China's most ancient and successful irrigation systems, watered by the Min River. First set up in the late 3rd century bc, the system has survived and has enabled the area to support one of the densest agrarian populations in the world. Chengdu was the capital of various dynasties, and in the 10th century ad it was immensely prosperous; its merchants introduced the use of paper money, which spread throughout China under the Song dynasty. Chengdu was famous for its brocades and satins. The capital of Sichuan since 1368, it has remained a major administrative centre. Today it is a transportation and industrial hub, as well as an educational centre.

Chengzong See Dorgon

Chennai \,chen-nl\ formerly Madras \m3-'dras\ City (pop., 2001 prelim.: city, 4,216,268; metro, area, 6,424,624), capital of Tamil Nadu state, India, on the Coromandel Coast of the Bay of Bengal. Founded in 1639

by the British East India Company as a fort and trading post, it was known as Fort St. George and was used as a base for the company's expansion in southern India. The city of St. Thome, established by the Portuguese in the 16th century, was ceded to the British in 1749 and incorporated into it. The English made Chennai their administrative and commercial capital c. 1800. It is an industrial centre and the site of numerous educational and cultural institutions. It is traditionally considered the burial place of St. Thomas the Apostle.

Chennault Xsho-'nohA, Claire L(ee) (b. Sept. 6, 1890, Commerce, Texas, U.S. — d. July 27, 1958, New Orleans, La.) U.S. brigadier general. He served in the army air corps for 20 years before retiring in 1937 because of increasing deafness. He became an air adviser to Chiang Kai-shek, and he formed the group of U.S. volunteer aviators called the Flying Tigers to combat the Japanese. Recalled to active duty in World War II, he commanded U.S. Army Air Forces in China (1942^-5). He and his Chinese wife, Anna, remained influential supporters of Chiang Kai-shek.

Cher River \'sher\ River, central France. Rising in the northwest of the Massif Central, it flows northwest, passing through Chenonceaux, where it is bridged by a historic chateau, then passes south of Tours to join the

Loire River after a course of 217 mi (349 km).

Cherbourg \sher-'bur,\ English Vsher-,burg\ Seaport (pop., 1999: 25,370) and naval station, northwestern France. Located on the English Channel, it is believed to occupy the site of an ancient Roman station. The French and English fought over the site in the Middle Ages. It was taken by the English in 1758, then passed to France and was extensively fortified by Louis XVI. In World War II the Germans held it until the Allies captured it in 1944; it became an important Allied supply port. Industries include transatlantic shipping, shipbuilding, and the manufacture of electronics and telephone equipment. Yachting and commercial fishing are also important.

Cherenkov radiation Xchs-'req-koA Light produced by charged particles when they pass through an optically transparent medium at speeds greater than the speed of light in that medium. For example, when electrons from a nuclear reactor travel through shielding water, they do so at a speed greater than that of light through water and they displace some electrons from the atoms in their path. This causes emission of electromagnetic radiation that appeal's as a weak bluish- white glow. The phenomenon is named for Pavel A. Cherenkov (1904-1990), who discovered it; he shared a 1958 Nobel Prize with Igor Y. Tamm (1895-1971) and Ilya M. Frank (1908-1990), who interpreted the effect.

Chernenko \cher-'n y ei]-ko\, Konstantin (Ustinovich) (b. Sept. 11, 1911, Bolshaya Tes, Yeniseysk, Russian Empire — d. March 10, 1985, Moscow, Russia, U.S.S.R.) Soviet leader. He joined the Communist Party in 1931 and rose through the ranks to become Leonid Brezhnev's chief of staff (1964). He was a full member of the Central Committee from 1971 and of the Politburo from 1977. An old-line conservative, he was considered by some to be Brezhnev's heir apparent, but he failed in a bid to succeed Brezhnev as party leader in 1982. When Yuri Andropov died, Chernenko succeeded him in 1984. His physical frailty soon became apparent, suggesting that his election had been intended as an interim measure; he died the next year.

Chernihiv \chir-'ne-he-ii\ Russian Chernigov \chir-'ne-g3f\ City (pop., 2001: 304,994), capital of Chernihiv oblast, Ukraine. It lies northeast of Kiev on the Desna River. Mentioned as early as ad 907, it became the capital of Chernihiv principality in the 11th century, when its cathedral was built. Chernihiv lost importance after the Tatar invasion (1239—40) and remained a minor provincial centre until modern times, when it developed as a railway junction.

Chernobyl accident Vchor-'no-boA Accident at the Chernobyl (Ukraine) nuclear power station in the Soviet Union, the worst in the history of nuclear power generation. On April 25-26, 1986, technicians attempted a poorly designed experiment, causing the chain reaction in the core to go out of control. The reactor's lid was blown off, and large amounts of radioactive material were released into the atmosphere. A partial meltdown of the core also occurred. A cover-up was attempted, but after Swedish monitoring stations reported abnormally high levels of wind-transported radioactivity, the Soviet government admitted the truth. Beyond 32 immediate deaths, several thousand radiation-induced illnesses and cancer deaths were expected in the long term. The incident set off an international outcry over the dangers posed by radioactive emissions.

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Chernov \ch9r-'nof\, Viktor (Mikhaylovich) (b. Nov. 19, 1873, Kamyshin, Russia — d. April 15, 1952, New York, N.Y., U.S.) Russian revolutionary, cofounder of the Russian Socialist Revolutionary Party. A revolutionist from 1893, he became a member of his party's central committee in 1902 and wrote the party's platform. In 1917 he served briefly as minister of agriculture. He was elected president of the constituent assembly that opened in Petrograd on Jan. 18, 1918, but was dispersed the next day by the Bolsheviks. He emigrated in 1920, wrote (sometimes as Boris Olenin) and lived in Paris until 1940, then went to the U.S., where he wrote for anticommunist periodicals.

Chernyshevsky \ch9r-ni-'shef-ske\, N(ikolay) G(avrilovich) (b.

July 12, 1828, Saratov, Russia — d. Oct. 17, 1889, Saratov) Russian radical journalist and politician. In 1854 he joined the staff of the review Sovremennik ("Contemporary"), where he focused on social and economic evils. Arrested on charges of subversion, he was imprisoned in 1862 and then exiled to Siberia, where he remained until 1883. While in prison he wrote the classic novel What Is to be Done? (1863), which greatly influenced future Russian revolutionaries.

Cherokee American Indian people of Iroquoian lineage living mostly in Oklahoma, U.S. Their traditional homeland is eastern Tennessee and the western Carolinas. Cherokee culture resembled that of the Creek and other Southeastern Indians. Their name is derived from a Creek word meaning "people of different speech"; many prefer to be known as Keetoowah or Tsalagi. Cherokee is an Iroquoian language, but it differs considerably from other Iroquoian languages. At the time of first contact, the Cherokee possessed stone implements, wove baskets, made pottery, cultivated com, beans, and squash, and hunted deer, bear, and elk. Wars and treaties in the late 18th century severely reduced Cherokee power and landholdings. After a series of failed raids against U.S. troops and civilian settlements, they ceded land to attain peace and to pay debts. After 1800 the Cherokee were remarkable for their assimilation of European/American culture, forming a government modeled on that of the U.S. and adopting European methods of farming and homemaking. Most became literate following the development of a syllabary by Sequoyah. Beginning c. 1835, when gold was discovered on Cherokee land in Georgia, agitation increased for their removal to the West. The ensuing events culminated in the Trail of Tears, which left some 4,000 Cherokee dead. People claiming sole Cherokee descent numbered some 281,000 in the 2000 U.S. census.

cherry Any of various trees of the genus Primus and their edible fruits. Most are native to the Northern Hemisphere, where they are widely grown. Three types are grown mainly for their fruit: sweet cherries (P. avium); sour, or tart, cherries (P. cerasus)\ and, to a much lesser extent, dukes (crosses of sweet and

sour cherries). Sweet-cherry trees are large, and their fruit is generally heart-shaped to nearly globular, varies in colour from yellow through red to nearly black, and has a low acid content. Sour-cherry trees are smaller and bear fruit that is round to oblate, generally dark red, and more acidic. Dukes are intermediate in both tree and fruit characteristics.

The wood of some cherry species is especially esteemed for the manufacture of fine furniture. Ornamental varieties selected for the beauty of their flowers are a common feature of gardens.

Cherry Valley Raid (Nov. 11, 1778) Attack during the American Revolution by Iroquois Indians on a New York frontier settlement. In retaliation for earlier assaults on two Indian villages, the Iroquois chief Joseph Brant joined with British loyalists to lead the attack on the fortified village at Cherry Valley. Thirty militiamen and settlers were killed.

Chersonese Vk9r-s3-,nez\ In ancient geography, any of several peninsulas in Europe and Asia (the term means “peninsula”). Tauric Chersonese comprised the Crimea and often the city of Chersonese, near modern Sevastopol. The city, founded by Ionian Greeks in the 6th century bc, later

traded with Athens, Delos, and Rhodes and flourished under the Romans and Byzantines. Thracian Chersonese constituted the modern Gallipoli Peninsula. On the main trade route between Europe and Asia, it was the site of several cities founded by Aeolians and Ionians in the 7th century bc. Abandoned to Darius I in 493 bc, it came under Athenian control and was later dominated by Augustus.

chert and flint Very fine-grained quartz, a silica mineral with minor impurities. Flint is gray to black and nearly opaque (translucent brown in thin splinters). Opaque, dull, whitish to pale brown or gray specimens are called simply chert. Chert and flint provided the main source of tools and weapons for Stone Age people. Flint is used today as an abrasive agent on sandpapers and in mills that grind raw materials for the ceramic and paint industries. Considerable amounts of chert are also used in road construction and as concrete aggregate. Some chert takes an excellent polish and is used as semiprecious jewelry. See also siliceous rock.

cherub In Jewish, Christian, and Islamic literature, a celestial winged being with human, animal, or birdlike characteristics. They are included among the angels, and in the Hebrew scriptures they are described as the throne bearers of God. In Christianity and Islam they are celestial attendants of God and praise him continually. Known as karubun in Islam, they repeat “Glory to God” ceaselessly, and they dwell in a section of heaven inaccessible to attacks by the Devil. In art they are often depicted as winged infants. See also seraph.

Cherubini \ l ka-ru-'be-ne\, Luigi (Carlo Zanobi Salvadore Maria) (b. Sept. 14, 1760, Florence — d. March 15, 1842, Paris, France)

Italian-French composer. Bom into a musical family, the precocious youth had written dozens of works before he was 20 years old. In 1786 he settled permanently in Paris. He enjoyed operatic successes in the 1790s, and Napoleon expressed his particular admiration. He became co-superintendent of the royal chapel in 1816 and in 1822 director of the Paris Conservatoire, where he would remain the rest of his life. Ludwig van Beethoven called Cherubini his greatest contemporary. His counter-point text (1835) was used widely for a century. Of his nearly 40 operas, the most popular were Lodoi'ska (1791), Medee (1797), and Les Deux Journees (1800). His other important works include a symphony (1815), six string quartets, requiems in C minor and D minor (1816, 1836), and nine surviving masses.

Chesapeake Vche-s9-,pek\ City (pop., 2000: 199,184), southeastern Virginia, U.S. Located south of Norfolk, it was formed as an independent city in 1963 by the merger of Norfolk county and the city of South Nor-folk. Its area of 341 sq mi (883 sq km) is one of the largest of U.S. cit-ies. Encompassing part of Dismal Swamp, it was once the home of the Chesapeake Indians and was settled by colonists in the 1630s.

Chesapeake and Ohio Canal National Historical Park Park, eastern U.S. It consists of the former Chesapeake and Ohio Canal, a waterway running along the Potomac River between Washington, D.C., and Cumberland, Md. The canal, which extends 185 mi (297 km), was built beginning in the 1820s. Competition from the railroads later caused its economic decline. The canal was purchased in 1938 by the U.S. gov-ernment; it was restored and established as a historical park in 1971.

Chesapeake and Ohio Railway Co. (C&O) U.S. railroad com-pany established in 1868 with the consolidation of two smaller lines, the Virginia Central and the Covington and Ohio. The railroad later acquired several other lines, mainly in the upper South and the Midwest, which together became known as the Chessie System. In 1972 its passenger ser-vices were taken over by Amtrak, and in 1980 it merged with Seaboard Coast Line Industries, Inc., to form the CSX Corp.

Chesapeake Bay Inlet of the Atlantic Ocean, eastern U.S. With its lower section in Virginia and its upper section in Maryland, it is 193 mi (311 km) long and 3-25 mi (5-40 km) wide and has an area of about 3,230 sq mi (8,365 sq km). It receives many rivers, including the Susque-hanna, Patuxent, Potomac, and James. Jamestown, the area’s first Euro-pean settlement, was founded in 1607; a year later, Capt. John Smith explored and mapped the bay. The bay’s waters had supported vast amounts of marine life, but by the 1970s development of the surround-ing area led to alarming pollution of the bay; fishing dropped off sharply. Efforts have since been made to reverse the damage.

Cheselden Vchez-ol-donX, William (b. Oct. 19, 1688, Somerby, Leicestershire, Eng. — d. April 10, 1752, Bath, Somersetshire) British sur-geon and teacher. His Anatomy of the Human Body (1713) and

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Osteographia (1733) were both used by anatomy students for nearly a century. His technique for extracting bladder stones through an incision in the side rather than the front (1727) was soon used by surgeons throughout Europe. He also devised a way to surgically create an “artificial pupil” to treat some forms of blindness.

Cheshire Vche-shoA Administrative (pop., 2001: 673,777), geographic, and historic county, northwestern England. The county seat is Chester. Cheshire borders Wales, fronts the Dee and Mersey estuaries to the northwest, and lies partly within Peak District National Park. Evidence of hill forts from the Bronze and Iron ages has been found, as well as ruins of structures from the Roman occupation. The county is largely rural, but, along with dairy farming, engineering and chemical and technology industries are important.

Chesnut, Mary orig. Mary Boykin Miller (b. March 31, 1823, Pleasant Hill, S.C., U.S. — d. Nov. 22, 1886, Camden, S.C.) U.S. writer. The daughter of a prominent South Carolina politician, she attended private schools in her youth. In 1840 she married James Chesnut, Jr., who would play an important role in the secession movement and the Confederacy. After her husband became an officer in the Confederate army, she accompanied him on his military missions and recorded her views and observations in her journal. Her Diary from Dixie, a perceptive view of Southern life during the American Civil War, was published in 1905.

Chesnutt, Charles (Waddell) (b. June 20, 1858, Cleveland, Ohio, U.S. — d. Nov. 15, 1932, Cleveland) U.S. writer, the first important African American novelist. As a young school principal in North Carolina, he was so distressed by the treatment of African Americans that he moved his family to Cleveland, where he became an attorney and began writing in his spare time. He published numerous tales and essays, two collections of short stories, a biography of Frederick Douglass, and three novels, including The Colonel’s Dream (1905). A psychological realist, he used familiar scenes of folk life to protest social injustice.

chess Checkerboard game for two players, each of whom moves 16 pieces according to fixed rules across the board and tries to capture or immobilize (checkmate) the opponent’s king. The game may have originated in Asia about the 6th century, though it continued to evolve as it spread into Europe in Byzantine times; its now-standard rules first became generally accepted in Europe in the 16th century. The players, designated white or black, start with their pieces arranged on opposite ends of the board. Kings move one square in any direction — but not into attack (check). Bishops move diagonally, and rooks horizontally or vertically, any number of unobstructed squares. Queens move like either bishops or rooks. Knights move to the nearest nonadjacent square of the opposite colour (an “L” shape) and ignore intervening chessmen. Pieces capture by moving to an enemy-occupied square. Pawns move forward one square (except one or two on their first move) and are promoted to any non-king piece if they eventually reach the last row. Pawns capture only one diagonal square forward of them. For one turn only, a pawn has the option, known as en passant, of capturing an enemy pawn that has just made a first move of two squares to avoid being captured by moving only one; the capture occurs as though the pawn had moved only one square. When the first row between

a king and either rook is clear, and as long as the king and that rook have not moved, a maneuver known as castling can be done in which the king is shifted two squares toward that rook and the rook is placed directly on the other side of the king. Kings cannot castle when in check or through any square in which they would be in check. A draw, known as a stalemate, occurs if a player is not in check but any move he could make would place him in check. A draw also occurs if the same position occurs three times (such as through “perpetual check”). See illustration opposite.

Chess, Leonard orig. Lejzor Czyz (b. March 12, 1917, Motule, Pol. — d. Oct. 16, 1969, Chicago, 111., U.S.) Polish-born U.S. record producer. He immigrated to the U.S in 1928 with his mother, sister, and brother and future partner, Fiszel (later Philip; b. 1921), and they joined his father, who had preceded them, in Chicago. After working at several trades, Leonard Chess opened a lounge, and Phil joined him in the business. In 1947 Leonard joined the Aristocrat record company; in 1950 he bought the company and, with Phil as partner, renamed it Chess. Fans of the electric blues that were being heard in the city after World War II, they signed such artists as Muddy Waters, Willie Dixon, Chuck Berry, Howlin’ Wolf (1910-76), Etta James (b. 1938), Koko Taylor (b. 1935), and Bo Diddley (b. 1928), and played a major role in introducing black music to a wider white audience.

Chess pieces located at their starting positions on the chessboard.

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Chester ancient Deva or Castra Devana City and administrative district (pop., 2001: 118,207), seat of Cheshire county, England. Located on the River Dee south of Liverpool, it is an active port and railroad centre. The Romans chose it as the headquarters of the 20th Legion; well-preserved Roman walls remain. It was the last place in England to surrender to William the Conqueror, who made it the centre of a palatinate earldom in 1071. It became an important port in the 13 th— 14th century, trading especially with Ireland. From about the 14th century, it was the scene of the presentation of the mystery plays of the Chester cycle. The

gradual silting of the Dee led to the city’s decline, but in the 19th century railroad traffic renewed Chester’s prosperity.

Chesterton, G(ilbert) K(eith)

(b. May 29, 1874, London, Eng. — d. June 14, 1936, Beaconsfield, Buckinghamshire) British man of letters. Chesterton was a journalist, a scholar, a novelist and short-story writer, and a poet. His works of social and literary criticism include Robert Browning (1903), Charles Dickens (1906), and The Victorian Age in Literature (1913). Even

before his conversion to Roman Catholicism in 1922, he was interested in theology and religious argument. His fiction includes The Napoleon of Notting Hill (1904), the popular allegorical novel The Man

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G.K. Chesterton, chalk drawing by James Gunn, 1 932; in the National Portrait Gallery, London.

COURTESY OF THE NATIONAL PORTRAIT GALLERY, LONDON

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Who Was Thursday (1908), and his most successful creation, the series of detective novels featuring the priest-sleuth Father Brown.

chestnut Any of four species of deciduous ornamental and timber trees of the genus Castanea, in the beech family. Native to temperate regions of the Northern Hemisphere, they bear burrlike fruits that contain two or three edible nuts. The usually tall trees have furrowed bark and lance-shaped leaves. The American chestnut (C. dentata), which once extended over a large area of eastern North America, has been almost eliminated by chestnut blight. The other three species are the European chestnut (C. sativa), the Chinese chestnut (C. mollissima), and the Japanese chestnut (C. crenata). The nuts of these three have local importance as food and are exported in large quantities, and varieties of all three are cultivated as ornamentals. The European chestnut produces useful timber as well; the American chestnut also was an important source of lumber and nuts before the arrival of the blight.

chestnut blight Plant disease caused by the fungus Endothia parasitica. Accidentally imported from East Asia and first observed in 1904 in New York, it has killed almost all native American chestnuts (Castanea dentata) in the U.S. and Canada and is destructive in other countries. Other blight-susceptible species include the European chestnut (C. sativa), the post oak (Quercus stellata), and the live oak. Symptoms include reddish brown bark patches that develop into sunken or swollen and cracked cankers that kill twigs and limbs. Leaves on such branches turn brown and wither but remain attached for months. Gradually the entire tree dies. The fungus persists for years in short-lived sprouts from old chestnut roots and in less susceptible hosts. It is spread locally by splashing rain, wind, and insects, and over long distances by birds. Chinese (C. mollissima)

and Japanese (C. crenata) chestnuts are resistant.

Chetumal \,cha-tu-'mal\ City (pop., 2000: 121,602), capital of Quintana Roo state, Mexico. Located on the eastern coast of the Yucatan Peninsula just north of Belize, it lies only 20 ft (6 m) above sea level. Founded in 1899, it became the territorial capital when Quintana Roo was separated from Yucatan state in 1902. It is set in tropical rainforests, and forest products form the basis of the local economy.

chevalier See knight

Chevalier \sh3-val-'ya\, Maurice (b. Sept. 12, 1888, Paris, France — d. Jan. 1, 1972, Paris) French singer and actor. He first appeared as a singer and comedian at the Folies-Bergere in 1909. He spent two years in a German prison camp during World War I. Known for his jaunty straw hat and bow tie and his lively, roguish manner, he went to Hollywood in 1929, where he appeared in movies that helped establish the musical as a film genre, including The Love Parade (1929) and The Merry Widow (1934). He was criticized for entertaining the Germans during the wartime occupation of France. His later films include Gigi (1958) and Fanny (1961). In 1958 he was presented with an honorary

Academy Award.

Cheviot Vshi-ve-9t\ Hills Range of hills along the England-Scotland border. Its highest elevation is Cheviot, at 2,676 ft (816 m). Evidence of prehistoric occupation is widespread. Part of the area was designated Northumberland National Park in 1956.

Chevreuse \sh3v-'rcez\, Marie de Rohan-Montbazon, duchess de orig. Marie de Rohan-Montbazon known as Madame de Chevreuse (b. December 1600 — d. Aug. 12, 1679, Gagny, France) French princess. She participated in several conspiracies against the ministerial government in Louis XII I’ s reign and the regency for Louis XIV. She was exiled several times for her activities, including participating in a plot against Cardinal de Richelieu, betraying state secrets to Spain, and plotting to assassinate Jules Mazarin.

chevrotain Vshev-rs-.tanV or mouse deer Any of several species (family Tragulidae) of small, delicately built ruminants of Asia and Africa. Resembling tiny deer, chevrotains stand about 12 in. (30 cm) at the shoul-

der and seem to walk on their hooftips. Their fur is reddish brown with spots and pale stripes. Males have small, curved tusks protruding downward from the upper jaw. Shy and solitary, they are active at night. Asiatic chevrotains are found in forests from India to the Philippines. The water chevrotain of western equatorial Africa inhabits thick cover on the banks of rivers and seeks escape in the water when disturbed.

Chewa Bantu-speaking people of eastern Zambia, northwestern Zimbabwe, and Malawi. They practice shifting (slash-and-burn) agriculture and they hunt and fish. Slavery was once universal among the Chewa. Descent, inheritance, and succession are matrilineal and polygyny is general. Chewa settlements are governed by a hereditary headman and a council of elders.

chewing or mastication Up-and-down and side-to-side movements of the lower jaw, using the teeth to grind food for easier swallowing. During chewing, the tongue shapes food into a lump and saliva lubricates it for swallowing. Chewing softens tough meat or vegetable fibres and exposes them to digestive enzymes.

chewing gum Sweetened product made from chicle and similar resilient substances that is chewed for its flavour. Tree resins have been chewed as teeth cleaners and breath fresheners since ancient times. The latex (called chicle) of the Central American sapodilla tree was first used to mass-produce chewing gum in the 19th century; its plasticity, insolubility in water, and ability to hold a flavour made it an ideal chewing-gum base. After World War II other gums and synthetic rubbers came to replace chicle.

Cheyenne Plains Indian people of Algonquian stock (see Algonquian languages), living principally in Montana and Oklahoma, U.S. Originally farmers, hunters, and gatherers who lived in central Minnesota, the Cheyenne moved in the early 19th century to regions around the Platte and Arkansas rivers and split into the Northern Cheyenne and the Southern Cheyenne. In these areas they adopted the lifestyle of the Plains Indians; after acquiring horses, they became more dependent on the buffalo for food and developed a tepee-dwelling nomadic mode of life. They performed the sun dance and placed heavy emphasis on visions in which an animal spirit adopted the individual and bestowed special powers on him. They had well-organized military societies and fought constantly with the Kiowa until c. 1840. In the 1870s they participated in various Indian uprisings, joining the Sioux at Little Bighorn in 1876. More than 11,100 people claimed sole Cheyenne descent in the 2000 U.S. census.

Cheyenne \shl-'an\ City (pop., 2000: 53,011), capital of Wyoming, U.S. It is the state’s largest city and has been the capital since 1869. It became an outfitting point for the Black Hills goldfields to the northeast and a major shipping point for cattle from Texas. Its own grazing lands became famed for their herds and cattle barons. In July it celebrates Frontier Days, which includes one of America’s oldest and largest rodeos. Nearby Fort Francis E. Warren was the site of the nation’s first intercontinental ballistic missile base (1957).

Cheyenne River River, northern central U.S. Rising in eastern Wyoming, it flows northeast 527 mi (850 km) to join the Missouri River in central South Dakota. Angostura Dam, part of the Missouri River basin irrigation project, is on the river near Hot Springs, S.D.

Cheyne \'chan\. Sir William Watson (b. Dec. 14, 1852, at sea off Hobart, Tas. — d. April 19, 1932, Fetlar, Shetland Islands, Scot.) English surgeon and bacteriologist. His early work on preventive medicine and bacterial causes of disease was strongly influenced by that of Robert Koch. He became a devoted follower of Joseph Lister and was a pioneer of antiseptic surgical methods in Britain. He published the important works

Antiseptic Surgery (1882) and Lister and His Achievements (1885).

Chhattisgarh State (pop., 2001 prelim.: 20,795,956), central India. Bordered by Madhya Pradesh, Uttar Pradesh, Jharkhand, Orissa, Andhra Pradesh, and Maharashtra states, it occupies 52,199 sq mi (135,194 sq km); its capital is Raipur. The Chhattisgarh Plain covers much of the state, with the land becoming more hilly to the north and west. The area now comprising Chhattisgarh was the eastern portion of Madhya Pradesh state before it was made into a separate state in 2000. It is rich in minerals, but the population is mainly engaged in agriculture.

Ch'i See Qi
ch'i See qi

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Chi-lin See Jilin
ch'i-lin See qilin
Chi-nan See Jinan

Chiang Ching-kuo or Jiang Jingguo Vje-'aq-'jiq-'gwoV (b. March 18, 1910, Qikou, Zhejiang province, China — d. Jan. 13, 1988, Taipei, Taiwan) Son of Chiang Kai-shek, and his successor as leader of the Nationalist government in Taiwan. He was formally elected by the National Assembly to a six-year presidential term in 1978 and reelected in 1984. He tried to maintain Taiwan's foreign-trade relationships and political independence as other countries began to break off diplomatic relations in order to establish ties with mainland China. Other actions during his presidency included ending martial law, allowing opposition parties, and encouraging native-born Taiwanese to participate in government.

Chiang-hsi See Jiangxi

Chiang Kai-shek Vje-'aq-'kI-'shekA English \chaq-kl-'shek\ or Chiang Chieh-shih or Jiang Jieshi Nje-'aq-je-'esh-'eX (b. Oct. 31,

1887, Zhejiang, China — d. April 5,

1975, Taipei, Taiwan) Head of the Nationalist government in China (1928^19) and later in Taiwan (1949-75). After receiving military training in Tokyo, in 1918 he joined Sun Yat-sen, leader of the Nationalist Party, which was trying to consolidate control over a nation in chaos. In the 1920s Chiang became commander in chief of the revolu-

tionary army, which he sent to crush warlords active in the north (see Northern Expedition). In the 1930s he and Wang Jingwei vied for control of a new central government with its capital at Nanjing. Faced with Japanese aggression in Manchuria and communist opposition led by Mao Zedong in the hinterland, Chiang decided to crush the communists first. This proved to be a mistake, and Chiang was forced into a temporary alliance with the communists when war broke out with Japan in 1937. After the war China's civil war resumed, culminating in the Nationalists' flight to Taiwan in 1949, where Chiang ruled, supported by U.S. economic and military aid, until his death, when his son, Chiang Ching-kuo, took up the reins of government. His years ruling Taiwan, though dictatorial, oversaw the island's economic development and increasing prosperity even in the face of its precarious geopolitical position. His failure to keep control of mainland China has been attributed to poor morale among his troops, lack of responsiveness to popular sentiment, and lack of a coherent plan for making the deep social and economic changes China required.

Chiang Mai Vjyaq-'mA City (pop., 1999 est.: 171,594), northwestern Thailand. Located on the Ping River about 80 mi (130 km) east of Myanmar, it was founded in the late 13th century as the capital of the independent Lan Na kingdom. Later subject to Myanmar, it was taken by the Siamese in 1774, but retained a degree of independence from Bangkok until the late 19th century. It is now northern Thailand's religious, economic, and cultural centre. Nearby is the temple complex of Wat Phra That Doi Suthop, whose monastery was built in the 14th century.

Chiang-su See Jiangsu

Chian-ning See Nanjing

Chiapas \che-'a-pas\ State (pop., 2000: 3,920,892), southeastern Mexico. Covering 28,653 sq mi (74,21 1 sq km), its capital is Tuxtla Gutierrez. It is mountainous and forested and is bounded by Guatemala and the Pacific Ocean. Most of its inhabitants are Indian peoples. The extraordinary Maya ruins of Palenque are in the northeastern rainforests. Bonhampak, with its famous Mayan murals, can be reached from the capital. Linked with Guatemala in colonial days, Chiapas became a Mexican state in 1824; its boundaries were fixed in 1882. In 1994 impoverished Indians and middle-class residents, protesting economic and social inequalities, formed the Zapatista National Liberation Army and launched an armed uprising that continued into the 21st century.

chiaroscuro Xke-.ar-o-'skyur-oV Italian "light-dark" Contrasting effects of light and shade in a work of art. Leonardo da Vinci brought the technique to its full potential, but it is usually associated with such 17th-century artists as Caravaggio and Rembrandt, who used it to outstanding effect. The chiaroscuro woodcut, produced by printing different tones of a colour from separate woodblocks on a single sheet of paper, was first produced in 16th-century Italy.

Chibcha \'chib-,cha\ or Muisca \'mwesko\ Group of South American

Indians who at the time of the Spanish conquest occupied the high valleys surrounding what are now Bogota and Tunja in Colombia. They had a population of more than 500,000 and were more centralized politically than any other South American people outside the Inca empire. Their economy was based on intensive agriculture, a variety of crafts, and extensive trade. Society was highly stratified. The Chibchan political structure was crushed by Spanish invaders in the 16th century, and by the 18th century they had been assimilated into the rest of the population. See also Andean civilization.

Chicago City (pop., 2000: 2,896,016), northeastern Illinois, U.S. Located on Lake Michigan and the Chicago River, Chicago has extensive port facilities. In the 17th century the name was associated with a portage between the Des Plaines and Chicago rivers connecting the St. Lawrence River and the Great Lakes with the Mississippi River. Fort Dearborn was built in 1803 on a tract acquired from Indians. It expanded rapidly after the completion of the Illinois and Michigan Canal (1848), which connected the Chicago and Mississippi rivers, and also became the nation’s chief rail centre. Rebuilt quickly after a hugely destructive fire in 1871, it was the site of the World’s Columbian Exposition in 1893. It was the birthplace of the steel-frame skyscraper in the late 19th century, and it boasts designs by eminent architects, including Louis H. Sullivan, Frank Lloyd Wright, and Ludwig Mies van der Rohe. Nuclear scientists produced the first nuclear chain reaction at the University of Chicago in 1942. After World War II the city underwent another building boom, but, as in other large cities, its population subsequently dropped as its suburbs grew. The third largest U.S. city, it is a major industrial, commercial, and transportation centre and is the site of the Chicago Mercantile Exchange and the Chicago Board of Trade. Several museums and the Art Institute of Chicago are located there.

Chicago, Judy orig. Judy Cohen (b. July 20, 1939, Chicago, 111., U.S.) U.S. multimedia artist. She studied at UCLA, and in 1970 she adopted the name of her hometown. Motivated by perceived discrimination in the art world and alienation from canonical art traditions, she developed “environments” featuring feminine imagery. Her most notable work, The Dinner Party (1974-79), is a triangular table with place settings for 39 important women, each represented by personalized ceramic plates and table runners embellished with embroidery styles typical of their eras. This installation established her reputation as a leader in feminist art. In 1973 she cofounded the Feminist Studio Workshop and Woman’s Building in Los Angeles.

Chicago, University of Independent university in Chicago, Illinois, U.S. It was founded in 1890 with an endowment from John D. Rockefeller. William Rainey Harper, its first president (1891-1906), did much to establish its reputation, and under Robert M. Hutchins (1929-51) the university came to be recognized for its broad liberal arts curriculum. The world’s first department of sociology was established there in 1892 under Robert E. Park. In 1942 it was the site of the first controlled self-sustaining nuclear chain reaction, under the direction of Enrico Fermi. Other notable achievements include the development of carbon- 1 4 dating and the isolation of plutonium. More than 70 scholars associated with the University of Chicago have been awarded Nobel Prizes in their fields. The university comprises an undergraduate college, several professional schools, and centres for advanced research, including the Oriental Institute (Middle Eastern studies), Yerkes Observatory, the Enrico Fermi Institute, and the Center for Policy Study. The university operates the Argonne National Laboratory.

Chicago and North Western Transportation Co. Former U.S. railroad company. It was created when employees of the financially troubled Chicago and North Western Railway Co. purchased its assets in 1972. The initial company, founded in 1859, evolved from the Galena and Chicago Union Railroad, which had been the first railroad to enter Chicago (1848). Employees ceased to hold a majority of the company's

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stock in 1983. The system served an 11-state region west of Lake Michigan, with principal routes in Wisconsin, Minnesota, Iowa, and Nebraska. It was purchased by Union Pacific in 1995.

Chicago literary renaissance Flourishing of literary activity in Chicago c. 1912-25. Its leading writers — Theodore Dreiser, Sherwood Anderson, Edgar Lee Masters, and Carl Sandburg — realistically depicted the contemporary urban environment, condemning the loss of traditional rural values in the increasingly industrialized and materialistic American society. Associated with the period were the Little Theatre, an outlet for young playwrights; the Little Room, a literary group; and magazines such as The Dial , Poetry, and The Little Review. The renaissance also encompassed a revitalization of newspaper journalism as a literary medium.

Chicago Race Riot of 1919 Most severe of about 25 race riots throughout the U.S. in the summer after World War I. Racial friction was intensified by the migration of African Americans to the North. On Chicago's South Side, the African American population had increased in 10 years from 44,000 to 109,000. The riot was triggered by the death of an African American youth swimming in Lake Michigan near a beach reserved for whites; he was stoned and he shortly drowned. When police refused to arrest the white man allegedly responsible, fighting broke out between gangs of African Americans and whites. Violence spread throughout the city, unchecked by the state militia. After 13 days, 38 people were dead (23 African Americans, 15 whites), and 537 injured, and 1,000 African American families were made homeless.

Chicago River River, northeastern Illinois, U.S. A small river, consisting of a northern and a southern branch, it originally flowed through Chicago into Lake Michigan. After a severe storm in 1885 caused the river to empty large amounts of polluted water into the lake, the river's flow was reversed by constructing a canal, completed in 1900, the building of which was considered a significant engineering feat. Now flowing inland, it is connected with the Des Plaines River by the Chicago Sanitary and Ship Canal.

Chicago School Group of architects and engineers who in the 1890s exploited the twin developments of structural steel framing and the electrified elevator, paving the way for the ubiquitous modern-day skyscraper. Their work earned Chicago a reputation as the "birthplace of modern

architecture.” Among the school’s members were Louis Sullivan, Daniel Burnham, and John Wellborn Root (1850-91).

Chicago Tribune Daily newspaper published in Chicago. The Tribune is one of the leading U.S. newspapers and long has been the dominant voice of the Midwest. Founded in 1847, it was bought in 1855 by six partners, including Joseph Medill (1823-99), who made the paper successful and increased its stature while promulgating his generally liberal views. He bought a controlling interest in 1874 and was publisher until his death. During Robert McCormick’s tenure (1914-55), the paper achieved the largest circulation among U.S. standard- sized newspapers and led the world in newspaper advertising revenue. The Tribune also reflected his nationalist-isolationist views, but its editorial positions moderated after his death. It subsequently became the flagship of the Tribune Company, which has holdings in broadcasting, cable TV, publishing, and other media.

Chichen Itza \che-'chen-et-'sa\ Ancient ruined Mayan city in Mexico’s Yucatan state. Chichen Itza was founded by the Maya about the 6th century ad in an arid region where water was obtained from natural wells called cenotes. The city was invaded in the 10th century — probably by a Mayan-speaking group under strong Toltec influence — and the invaders constructed another series of buildings, including the famous stepped pyramid known as El Castillo and a ball court. The site, though largely abandoned by the time the Spanish arrived in the 16th century, remained sacred to the Maya people. It was designated a World Heritage site in 1988. See photograph opposite.

Chicherin \chi-'cher-yin\, Georgy (Vasilyevich) (b. Nov. 24, 1872, Tambov province, Russia — d. July 7, 1936, Moscow, Russia, U.S.S.R.) Russian diplomat. An aristocrat by birth, he entered the imperial diplomatic service in 1897 but resigned to join the revolutionary movement and the Menshevik faction (1905). In 1918 he joined the Bolsheviks and resumed his diplomatic career, helping negotiate the Treaty of Brest-Litovsk. As people’s commissar for foreign affairs (1918-28), he led the Soviet delegation to the Conference of Genoa and later secretly negotiated the Treaty of Rapallo with Germany.

Chichester City (pop., 2001: 27,477), Chichester district, administrative county of West Sussex, England. It is located northeast of Portsmouth. The basic plan of the Roman town is preserved in the modem one. The economy relies mainly on agriculture and retailing. Chichester is noted for its early Norman cathedral, begun in the late 11th century, and for its pastoral landscapes.

chickadee Any of several North American songbird species in the genus Parus (family Paridae), whose name imitates their call notes. They are friendly and easily attracted to feeders. The black-capped chickadee (P atricapillus), found across North America, is 5 in. (13 cm) long and has a dark cap and bib. Old World members of the genus and some New World members are called TITS or titmice.

Chickamauga, Battle of (Sept.

19-20, 1863) Engagement in the American Civil War fought over control of the railroad centre of nearby Chattanooga, Tenn. Confederate forces under Braxton Bragg and James Longstreet attacked Union forces under William Rosecrans. After two days of fierce fighting, most of the Union army withdrew in disorder, though troops under George H. Thomas withstood the assault until the assistance of a reserve corps made possible an orderly withdrawal to Chattanooga. Casualties numbering

16.000 Union and 18,000 Confederate troops made this one of the bloodiest battles of the war. Bragg and the Confederate force did not follow up their victory, and the subsequent Battle of Chattanooga reversed the results.

Chickasaw North American Indian people living mainly in Oklahoma, U.S. Their language, Chickasaw, is a Muskogean language closely related to that of the Choctaw. The Chickasaw, who once inhabited Kentucky, Tennessee, northern Mississippi, and Alabama, were a seminomadic people whose dwellings were loosely scattered along rivers rather than clustered in villages. They traced descent through the maternal line. The supreme deity was associated with the sky, sun, and fire. They frequently raided and intermarried with other tribes, and they were known to white traders as “mixed-bloods” or “breeds.” In the 1830s they were forcibly removed to Indian Territory (Oklahoma). In the 2000 U.S. census some

20.000 individuals claimed sole Chickasaw descent.

Black-capped chickadee (Parus atricapillus)

WILLIAM D. GRIFFIN

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chicken One of the most widely domesticated poultry species (Gallus gallus), raised worldwide for its meat and eggs. Descended from the wild red jungle fowl of India, chickens have been domesticated for at least 4,000 years. Not until the 19th century did chicken meat and eggs become mass-production commodities. Modem high-volume poultry farms, with rows of cages stacked indoors for control of heat, light, and humidity, began to proliferate in Britain c. 1920 and in the U.S. after World War II (see factory

farming). Females are raised for meat and eggs; immature males are castrated to become meat birds called capons. See also prairie chicken.

chickenpox or varicella \,var-9-'se-l9\ Contagious viral disease producing itchy blisters. It usually occurs in epidemics among young children, causes a low fever, and runs a mild course, leaving patients immune. The blisters can scar if scratched. The virus that causes chickenpox (varicella-zoster virus) can reactivate years later, causing shingles. Zoster immune globulin (ZIG) can prevent chickenpox in children with leukemia or immunodeficiency disorders who are exposed to the virus. A vaccine has also been developed.

chickpea or garbanzo Annual legume (Cicer arietinum) widely grown for its nutritious seeds. The bushy 2-ft (60-cm) plants bear pinnate leaves and small white or reddish flowers. The yellow-brown peas are borne one or two to a pod. Chickpeas are an important food plant in India, Africa, and Central and South America. They are the main ingredient of hummus, a sauce originating in the Middle East. In southern Europe, chickpeas are a common ingredient in soups, salads, and stews. A kind of meal or flour is also made from chickpeas.

chickweed Either of two species of small-leaved weeds, in the pink family. Common chickweed, or stitchwort (Stellaria media), is native to Europe but widely naturalized. It usually grows to 18 in. (45 cm) but is a low-growing and spreading annual weed in mowed lawns. Mouse-ear chickweed (Cerastium vulgatum), also from Europe, is a usually shorter, mat-forming, spreading perennial with many upright stems. It grows in lawns, pastures, and cultivated fields throughout temperate regions. Both species have inconspicuous but delicate white, star-shaped flowers.

chicory Blue-flowered perennial plant (Cichorium intybus) of the COMPOSITE family. Native to Europe, it was introduced to the U.S. late in the 19th century. Chicory has a long, fleshy taproot; a rigid, branching, hairy stem; and lobed, toothed leaves, similar in appearance to dandelion leaves, around the base. Both roots and leaves are edible. The roots are used as a flavouring in or substitute for coffee. The plant is also grown as a fodder or herbage crop for cattle.

chief justice Presiding judicial officer within any multijudge court. It is the title of the highest judicial officer in any U.S. state, and of the leader of the U.S. Supreme Court. The U.S. chief justice, like the associate justices, is nominated by the president and confirmed by the Senate for a lifetime tenure. The chief justices of some state supreme courts are subject to popular election and mandatory retirement ages. Chief justices are normally responsible for the administration of their own court and the preparation of the judiciary’s budget.

chiefdom Type of sociopolitical organization in which political and economic power is exercised by a single person (or group) over many communities. It represents the centralization of power and authority at the expense of local and autonomous groupings. Political authority in chiefdoms, such as those found in western Africa or Polynesia, is inseparable from economic power, including the right by rulers to exact tribute and taxation. A principal economic activity of the heads of chiefdoms is to stimulate the production of economic surpluses, which they then redistribute among their subjects on various occasions. See also sociocultural EVOLUTION.

Chiem Vkem\, Lake German Chiemsee Vkem-,za\ Lake, southern Germany. Located southeast of Munich, it lies 1,699 ft (518 m) above sea level, and drains through the Alz River into the Inn River. At 9 mi (15 km) long and 5 mi (8 km) wide, it is Bavaria’s largest lake. One of its three islands has a Benedictine monastery and a royal castle modeled on the palace at Versailles.

Ch'ien-lung emperor See Qianlong emperor

chigger Larva of some 10,000 mite species, ranging in length from 0.004 to 0.6 in. (0. 1-16 mm). Some are terrestrial; others live in freshwater or salt water. They may be predators, scavengers, or plant feeders, and some are pests of humans, either as parasites or as carriers of disease. In North America, the common chigger that attacks humans is found from the Atlantic coast to the Midwest and Mexico. The larva penetrates clothing and, once attached to the skin, injects a fluid that digests tissue and causes severe itching. After feeding, the larva drops to the ground and begins to mature.

Chih-i See Zhiyi
Chihli See Hebei
Chihli, Gulf of See Bo Hai

Chihuahua Smallest recognized dog breed, named for the Mexican state where it was first noted in the mid- 19th century. It probably derived from the Techichi, a small, mute dog kept by the Toltec people as long ago as the 9th century. Typically a feisty-looking, alert dog that is sturdier than its small build would suggest, it stands about 5 in. (13 cm) high and weighs 1-6 lb (0.5-2. 7 kg). It has a rounded head, large, erect ears, prominent eyes, and a compact body. The coat varies in colour and may be either smooth and glossy or long and soft.

Chihuahua \che-'wa-wa\ State (pop., 2000: 3,052,907), northern Mexico. The country’s largest state, it covers 94,571 sq mi (244,938 sq km) and borders the U.S. states of New Mexico and Texas. Its capital is Chihuahua city. It consists largely of an elevated plain sloping northward toward the Rio Grande. Its western area is broken by the Sierra Madre Occidental. Chihuahua’s Copper Canyon (Barranca del Cobre) resembles the U.S. Grand Canyon in scale but is almost inaccessible. In Spanish colonial times it was ruled with Durango but was made a separate state in 1823. The state’s principal industry is mining; livestock raising is also important to the economy.

Chihuahua City (pop., 2000: 657,876), capital of Chihuahua state, Mexico. Founded in 1709, it was a prosperous mining centre during the colonial era. It was twice captured by U.S. forces during the Mexican War (1846-48). Now the centre of a cattle-raising area, it has many noteworthy buildings, including the Church of San Francisco, one of the best examples of 18th-century Mexican colonial architecture.

Chikamatsu Monzaemon Vche-'ka-mat-su-mon-'za-a-monV orig. Sugimori Nobumori (b. 1653, Echizen, Japan — d. Jan. 6, 1725, Osaka) Japanese playwright. Born into a samurai family, he was attached to the court aristocracy at Kyoto before moving to Osaka to be near its puppet theatre. He is credited with more than 100 plays, mainly historical romances and domestic tragedies, many based on actual incidents. Most were written for the bunraku, which he raised to artistic heights. His

most popular work was The Battles of Coxinga (1715), a historical melodrama based on the life of Zheng Chenggong. Also famous is Double Suicide at Amijima (1720). He is widely regarded as the greatest of Japanese dramatists.

Child, Julia orig. Julia McWilliams (b. Aug. 15, 1912 , Pasadena, Calif., U.S. — d. Aug. 13, 2004, Santa Barbara) U.S. cooking expert and television personality. She lived in Paris after her marriage in 1945, studying at the Cordon Bleu and with a master chef. After cowriting the best-seller Mastering the Art of French Cooking (1961) and moving to Boston, she created the popular PBS cooking series The French Chef (1963-73), and later other cooking shows. Through her programs and books, she helped educate the U.S. public about traditional French cuisine and sparked interest in the culinary arts.

Child, Lydia Maria orig. Lydia Maria Francis (b. Feb. 11, 1802, Medford, Mass., U.S. — d. Oct. 20, 1880, Wayland) U.S. abolitionist and author. She was raised in an abolitionist family and was greatly influenced by her brother, a Unitarian clergyman. She wrote historical novels and published a popular manual, The Frugal Housewife (1829). After meeting William Lloyd Garrison in 1831, she became active in abolitionist work. Her Appeal in Favor of That Class of Americans Called Africans (1833) was widely read and induced many to join the abolitionist cause. From 1841 to 1843 she edited the National Anti-Slavery Standard. Her home was a stage on the Underground Railroad.

child abuse Crime of inflicting physical or emotional injury on a child. The term can denote the use of inordinate physical violence or verbal abuse; the failure to furnish proper shelter, nourishment, medical treatment, or emotional support; incest, rape, or other instances of sexual molestation; and the making of child pornography. Child abuse can cause serious harm to its victims. Estimates of the numbers of children who suffer physical abuse or neglect by parents or guardians range from about 1 percent of all children to about 15 percent, and figures are far higher if emo-

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tional abuse and neglect are included. In many cases, the abuser himself suffered abuse as a child. When abuse results in death, evidence of child abuse or battered-child syndrome (e.g., broken bones and lesions, either healed or active) is often used to establish that death was not accidental.

child development Growth of perceptual, emotional, intellectual, and behavioral capabilities and functioning during childhood (prior to puberty). It includes development of language, symbolic thought, logic, memory, emotional awareness, empathy, a moral sense, and a sense of identity, including sex-role identity.

child labour Employment of boys and girls in occupations deemed unfit for children. Such labour is strictly controlled in many countries as a result of the effective enforcement of laws passed in the 20th century

(e.g., the United Nations Declaration of the Rights of the Child in 1959). In developing nations the use of child labour is still common. Restrictive legislation has proved ineffective in impoverished societies with few schools, although some improvements have resulted from global activism, such as boycotts of multinational firms alleged to be exploiting child labour abroad.

child psychiatry Branch of medicine concerned with mental, emotional, and behavioral disorders of childhood. It arose as a separate field in the 1920s, largely because of the pioneering work of Anna Freud. Therapy usually involves the family, whose behaviour powerfully affects children's emotional health. Parental death or divorce may affect a child's emotional growth. Child abuse and neglect have also been recognized as significant in childhood disorders. Learning disabilities need to be distinguished from emotional problems — which they can also cause if not diagnosed in time.

child psychology Study of the psychological processes of children. The field is sometimes subsumed under developmental psychology. Data are gathered through observation, interviews, tests, and experimental methods. Principal topics include language acquisition and development, motor skills, personality development, and social, emotional, and intellectual growth. The field began to emerge in the late 19th century through the work of German psychophysiologist William Preyer, American psychologist G. Stanley Hall, and others. In the 20th century the psychoanalysts Anna Freud and Melanie Klein devoted themselves to child psychology, but its most influential figure was Jean Piaget, who described the various stages of childhood learning and characterized children's perceptions of themselves and the world at each stage. See also school psychology.

childbirth See parturition

Childe, V(ere) Gordon (b. April 14, 1892, Sydney, N.S.W., Australia — d. Oct. 19, 1957, Mount Victoria, N.S.W.) Australian-British archaeologist. He taught at the University of Edinburgh (1927-46) and later directed the Institute of Archaeology at the University of London (1946-56). His study of European prehistory, especially in The Dawn of European Civilization (1925), sought to evaluate the relationship between Europe and the Middle East and to examine the structure and character of ancient cultures of the Western world. His later books included The Most Ancient Near East (1928) and The Danube in Prehistory (1929). His approach established a tradition of prehistoric studies.

Childebert Vchil-do-.bsrA II (b. 570 — d. Dec. 595) Merovingian king of Austrasia (575-95) and king of Burgundy (592-95). (See Merovingian dynasty.) He inherited the eastern Frankish kingdom of Austrasia on the death of his father, Sigebert I, and was dominated by his mother in the early years of his reign. His uncle, Guntram of Burgundy, adopted Childebert as his heir in 577. When he came of age he purged the Austrasian nobility (584) and launched a series of unsuccessful campaigns against the Lombards of Italy. He became ruler of Burgundy on his uncle's death in 592.

Children's Crusade (1212) Religious movement in Europe in which thousands, including many children and young people, set out to take the Holy Land from the Muslims by love instead of by force. The events of the Crusade are disputed. According to one version, only partially accurate, the first group of approximately 30,000 was led by a French shepherd boy, Stephen of Cloyes, who had a vision of Jesus and received a

letter from him. Stephen led the Crusade to Paris and delivered the letter to King Philip II Augustus, who dispersed the Crusaders. A German boy led the second group across the Alps; a few survived to reach Rome, where Innocent III released them from their vows. Contemporary accounts describing horrible fates of the participants should be treated cautiously because they were written by those hostile to the movement. Though the

movement ended without reaching the Holy Land, it excited religious fervour that helped initiate the Fifth Crusade (1217-21).

children's literature Body of written works produced to entertain or instruct young people. The genre encompasses a wide range of works, including acknowledged classics of world literature, picture books and easy-to-read stories, and fairy tales, lullabies, fables, folk songs, and other, primarily orally transmitted, materials. It emerged as a distinct and independent form only in the second half of the 1 8th century and blossomed in the 19th century. In the 20th century, with the attainment of near-universal literacy in most developed nations, the diversity in children’s books came almost to rival that of adult popular literature.

Childress Vchil-drosV Alice (b. Oct. 12, 1916, Charleston, S.C., U.S. — d. Aug. 14, 1994, New York, N.Y.) U.S. playwright, novelist, and actress. She grew up in Harlem and studied drama with the American Negro Theatre, where she wrote, directed, and starred in her first play, Florence (produced 1949). Her other plays, some featuring music, include Trouble in Mind (produced 1955), String (1969), The African Garden (1971), and Gullah (1984). She was also a successful writer of children’s books, including A Hero Ain’t Nothing but a Sandwich (1973).

Chile Vche-la,\ English Vchi-le\ officially Republic of Chile Country, southwestern South America. Area: 291,930 sq mi (756,096 sq km). Popu-

lation (2005 est.): 16,295,000. Capital: Santiago. About three-fourths of Chileans are mestizos; most of the rest are of European ancestry or Aracanian (Mapuche) Indians.

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The indigenous peoples before Spanish colonization included the Diaguita, Picunche, Mapuche, Huilliche, Pehunche, and Cunco Indians. Spanish colonists arrived during the 16th- 17th centuries, followed by Basque settlers in the 18th century. A relatively homogeneous population of mestizos has developed. Language: Spanish (official). Religion: Christianity (predominantly Roman Catholic; also Protestant, other Christians). Currency: Chilean peso. Chile is noteworthy for its unique topography: it is

a long, narrow country lying between the Andes Mountains and the Pacific Ocean. From north to south it is about 2,700 mi (4,300 km) long and nowhere more than 217 mi (349 km) wide. The north has an arid plateau, the Atacama Desert, and contains several peaks above 16,000 ft (4,900 m), but most of the highest peaks are on the borders with Bolivia and Argentina. The rivers, including the Bio-Bfo, are limited in size. There are many lakes, including Lake Llanquihue. The extreme southern coast is marked by many inlets, islands, and archipelagoes; the western half of Tierra del Fuego (including the island on which Cape Horn is located) is in Chilean territory, as are small islets of Juan Fernandez and Easter Island. Chile has a partially developed free-market economy based mainly on mining and manufacturing. It is a republic with two legislative houses; its head of state and government is the president. Originally inhabited by native peoples, including the Mapuche, the area was invaded by the Spanish in 1536. A settlement begun at Santiago in 1541 was governed under the Viceroyalty of Peru but became a separate captaincy general in 1778. Its people revolted against Spanish rule in 1810; independence was finally assured by the victory of Argentine and Chilean forces under Jose de San Martin at the Battle of Chacabuco in 1817. The area was governed by Chilean Gen. Bernardo O'Higgins until 1823. In the War of the Pacific (1879-83) against Peru and Bolivia, Chile won the rich nitrate fields on the coast of Bolivia, effectively severing that country’s access to the coast. Chile remained neutral in World War I (1914-18) and for most of World War II (1939^-5), though in 1942 it joined other Latin American countries in declaring war on the Axis. In 1970 Salvador Allende was elected president, becoming the first avowed Marxist to be elected head of state in Latin America. Following economic upheaval, he was overthrown in 1973 in a coup led by Augusto Pinochet, whose military regime harshly suppressed internal opposition. A national referendum in 1988 and elections the following year removed Pinochet from power and returned the country to democratic rule. Chile’s economy maintained steady growth through most of the 1990s and in the early 21st century remained one of the strongest in Latin America.

Chilka Lake Lake, eastern India. Located in Orissa state, and separated from the Bay of Bengal by a narrow spit, it is one of India’s largest lakes, at 40 mi (65 km) long and 5-13 mi (8-20 km) wide. It was once a bay of the ocean until it was silted up by monsoon tides. Dotted with islands, it offers good hunting, boating, and fishing.

Chiloe \,che-lo-'a\ Island, southwestern Chile. Lying some 30 mi (50 km) off the mainland, it has an area of 3,241 sq mi (8,394 sq km). Spaniards captured it from Indians in 1567 and controlled it until 1826, making it a last foothold in Chile of royalist forces during the wars for independence. Heavily forested, the island is little developed. The island’s inhabitants make their living by agriculture, fishing, and forestry.

Chilpancingo \,chel-pan-'seq-go\ in full Chilpancingo de los Bravos City (pop., 2000: 142,746 136,000), capital of Guerrero state, southern Mexico. Located in the Sierra Madre del Sur, it was founded in 1591 and gained prominence as the site of the first Mexican congress, convoked in 1813. Battles were fought there in both the war for independence from Spain and in the Mexican Revolution. It is an agricultural centre for the surrounding region.

Chilperic Vchil-p9-rik\ I (b. c. 539 — d. September or October 584, Chelles, France) Merovingian king of Soissons. On the death of his father, Chlotar I, he and his three half brothers divided the kingdom. Chilperic

received Soissons, the poorest share, but gained more land when one of his brothers died. Thus Chilperic became the ruler of most of the kingdom later known as Neustria. Ambitious, brutal, and debauched, he was called the Nero and Herod of his age by a contemporary writer. Chilperic murdered his own wife in order to marry his mistress, Fredegund. The murder led to years of intrigue by family members seeking revenge and civil war. He was finally killed, possibly at Fredegund' s orders, by an unknown assassin. He was survived by his wife and an infant son.

Chilwa Vchil-wa\, Lake Lake, southeastern Malawi. It lies in a depression southeast of Lake Malawi between the Shire Highlands and the

Mozambique border. Today it covers about 1,000 sq mi (2,600 sq km); it was much larger when David Livingstone arrived there in 1859, and originally it filled the entire depression.

Chimborazo \,chem-bo-'ra-zo\ Mountain peak, Ecuador. The highest peak in Ecuador, elevation 20,702 ft (6,310 m), it was once thought to be the highest in the Andes Mountains (see Mount Aconcagua). An inactive volcano, it is heavily glaciated. Many attempted to climb it in the 18th and 19th centuries, but the summit was not reached until 1880, by the English mountaineer Edward Whymper.

Chimera Vkl-'mir-oN In Greek mythology, a fire-breathing female monster. Its foreparts resembled a lion, its middle a goat, and its hindquarters a dragon. It devastated the land around Caria and Lycia until it was killed by Bellerophon. The word is now often used to denote a fantasy or a figment of the imagination.

chimera or chimaera \kI-'mir-3\ Any of the 28 species of ancient fishes constituting the subclass Holocephali (class Chondrichthyes), found in temperate to cold waters of all oceans. Like sharks and rays, chimeras have a skeleton of cartilage rather than bone, and the males possess external reproductive organs (claspers). They have a single external gill opening, covered by a flap as in the bony fishes, on each side of the body. Males have a supplemental clasping organ that is unique among fishes. Chimeras have large pectoral and pelvic fins and two dorsal fins, the first preceded by a sharp spine. They range in length from 24 to 80 in. (60 to 200 cm) and in colour from silvery to blackish. They inhabit rivers, estuaries, coastal waters, and open ocean to depths of 8,000 ft (2,500 m) or more. They eat small fishes and invertebrates.

Chimkent See Shymkent

chimpanzee Species (Pan troglodytes) of great ape that inhabits the rain forests and woodland savannas of equatorial Africa, the closest living relative to humans. Chimps are 3-5.5 ft (1-1.7 m) tall when standing upright, weigh 70-130 lbs (32-60 kg), and have a brown or black coat and a bare face. They do most of their feeding in the trees, swinging from branch to branch; to move any distance they walk, usually on all fours, on the ground. They eat mostly fruits, berries, leaves, and

seeds, some termites and ants, and occasionally a young baboon or bush pig. They are capable of problem solving, tool use, and deceit. Chimpanzees are highly social and live in flexible groups (15-100 or more members) known as communities. In the wild they live about 45 years, in captivity more than 50. See also bonobo.

Chimu \che-'mu\ South American Indians who maintained the largest and most important political system in Peru before the advent of the Inca. The Chimu state took shape in the early 14th century. It was a highly stratified society, with a mass of peasants labouring under a ruling nobility. Its capital, Chan Chan, on the northern coast of present-day Peru, is now a major archaeological site. The Chimu produced fine textiles and gold, silver, and copper objects. In the 15th century they were conquered by the Inca, who absorbed much of Chimu high culture into their own imperial organization.

Chin dynasty See Jin dynasty, Juchen dynasty
Ch'in dynasty See Qin dynasty

Chin Hills Mountainous region, northwestern Myanmar (Burma). Extending along the Indian border, it forms the central part of an arc that stretches from the Arakan Mountains to the Patkai Range. The Chin Hills vary from 7,000 to 10,000 ft (2,000 to 3,000 m) high. They and the arc are part of the north-south-trending mountain belt of Southeast Asia, which has hindered east-west movement; the region was populated by the Chin peoples from the north. It is a frontier zone between Myanmar and Indian cultures.

Ch'in Kuei See Qin Gui
Chin-sha River See Jinsha River

West African, or masked, chimpanzee (Pan troglodytes verus).

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China officially People's Republic of China Country, eastern Asia. Area: 3,696,100 sq mi (9,572,900 sq km). Population (2005 est.): 1,304,369,000. Capital: Beijing. It is the world’s most populous country, the Han (ethnic Chinese) forming more than nine-tenths of the population. Languages: dialects of Han Chinese, Mandarin being

the most important. Religions: traditional beliefs, Buddhism, Christianity, Islam, Daoism (all legally sanctioned). Currency: renminbi (of which the unit is the yuan). China has several topographic regions. The southwestern area contains the Plateau of Tibet, which averages more than 13,000 ft (4,000 m) above sea level; its core area, averaging more than 16,000 ft (5,000 m) in elevation, is called “the Roof of the World” and provides the headwaters for many of Asia’s major rivers. Higher yet are the border ranges, the Kunlun Mountains to the north and the Himalayas to the south. China’s northwestern region stretches from Afghanistan to the Northeast (Manchurian) Plain. The Tien Shan (“Celestial Mountains”) separate China’s two major interior basins, the Tarim Basin (containing the Takla Makan Desert) and the Junggar Basin. The Mongolian Plateau contains the southernmost part of the Gobi Desert. The lowlands of the eastern region include the Sichuan Basin, which runs along the Yangtze River (Chang Jiang); the Yangtze divides the eastern region into northern and southern parts. The Tarim is the major river in the northwest. China’s numerous other rivers include the Huang He (Yellow River), Xi, Sungari (Songhua), Zhu (Pearl), and Lancang, which becomes the Mekong in Southeast Asia. The country is a single-party people’s republic with one legislative house. The chief of state is the president, and the head of government is the premier.

The discovery of Peking man in 1927 (see Zhoukoudian) dates the advent of early hominins (human ancestors) to the Paleolithic Period. Chinese civilization is thought to have spread from the Huang He valley. The first dynasty for which there is definite historical material is the Shang (c. 17th century bc), which had a writing system and a calendar. The Zhou, a subject state of the Shang, overthrew its Shang rulers in the mid- 11th century and ruled until the 3rd century bc. Daoism and Confucianism were founded in this era. A time of conflict, called the Warring States period, lasted from the 5th century until 221 bc. Subsequently the Qin (or Chin) dynasty (from whose name China is derived) was established, after its rulers had conquered rival states and created a unified empire. The Han

dynasty was established in 206 bc and ruled until ad 220. A time of turbulence followed, and Chinese reunification was achieved with the founding of the Sui dynasty in 581 and continued with the Tang dynasty (618—907). After the founding of the Song dynasty in 960, the capital was moved to the south because of northern invasions. In 1279 this dynasty was overthrown and Mongol (Yuan) domination began. During that time Marco Polo visited Kublai Khan. The Ming dynasty followed the period of Mongol rule and lasted from 1368 to 1644, cultivating antiforeign feelings to the point that China closed itself off from the rest of the world. Peoples from Manchuria overran China in 1644 and established the Qing (Manchu) dynasty. Ever-increasing incursions by Western and Japanese interests led in the 19th century to the Opium Wars, the Taiping Rebellion, and the Sino-Japanese War, all of which weakened the Manchu. The dynasty fell in 1911, and a republic was proclaimed in 1912 by Sun Yat-sen. The power struggles of warlords weakened the republic. Under Chiang Kai-shek some national unification was achieved in the 1920s, but Chiang broke with the communists, who had formed their own armies. Japan invaded northern China in 1937; its occupation lasted until 1945 (see Manchukuo). The communists gained support after the Long March (1934-35), in which Mao Zedong emerged as their leader. Upon Japan’s surrender at the end of World War II, a fierce civil war began; in 1949 the Nationalists fled to Taiwan, and the communists proclaimed the People’s Republic of China. The communists undertook extensive reforms,

but pragmatic policies alternated with periods of revolutionary upheaval, most notably in the Great Leap Forward and the Cultural Revolution. The anarchy, terror, and economic paralysis of the latter led, after Mao's death in 1976, to a turn to moderation under Deng Xiaoping, who undertook economic reforms and renewed China's ties to the West. The government established diplomatic relations with the U.S. in 1979. Since the late 1970s the economy has been moving from central planning and state-run industries to a mixture of state-owned and private enterprises in manufacturing and services, in the process growing dramatically and transforming Chinese society. The Tiananmen Square incident in 1989 was a challenge to an otherwise increasingly stable political environment after 1980. In 1997 Hong Kong reverted to Chinese rule, as did Macau in 1999.

china, bone See bone china

China Sea Part of the western Pacific Ocean. Reaching from Japan to the southern end of the Malay Peninsula, it is divided by the island of Tai-

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wan into two sections. The northern section is the East China Sea, or Eastern Sea, which covers an area of some 290,000 sq mi (751,100 sq km), has a maximum depth of 8,912 ft (2,717 m), and is enclosed by eastern China, South Korea, the Japanese island of Kyushu, the Ryukyu Islands, and Taiwan. The southern section is the South China Sea, often called simply the China Sea, which covers an area of 1,423,000 sq mi (3,685,000 sq km), has a maximum depth of about 16,000 ft (5,000 m), and is enclosed by southeastern China, Taiwan, the Philippines, Borneo, and mainland Southeast Asia.

chinchilla \chin-'chi-ls\ Small South American rodent (genus Chinchilla, family Chinchillidae) long valued for its extremely fine-textured fur. Chinchillas look like long-tailed, small-eared rabbits. They are about 14 in. (35 cm) long, including the tufted tail. The soft fur is gray with dusky overtones; a black streak runs the length of the tail, above and below. Chinchillas live in loose communities in arid, rocky regions of the Chilean and Bolivian Andes, in burrows or rock crevices. They eat seeds, fruit, grain, herbs, and moss.

Once hunted almost to extinction, they are still scarce in the wild. They are raised commercially; almost all animals in captivity have descended from a few animals introduced into the U.S. in 1923.

Chindwin River River, northern Myanmar. Rising in the northern mountains, it flows 520 mi (840 km), at first northwest through the Hukawng valley, then southwest near the border with India, and finally south to join the Irrawaddy at Myingyan. It is generally navigable below its confluence with the Uyu River. It was the scene of heavy fighting during World War II.

Chinese cabbage Either of two widely cultivated members of the mustard family, bok choy and Brassica pekinensis. The latter vegetable, also called celery cabbage, forms a tight head of crinkled light green leaves. It has long been grown in the U.S. as a salad vegetable. All Chinese cabbages are delicate and crisp, qualities that enable them to combine with a wide variety of foods. Kimchi, the universal Korean pickle, is often made with Chinese cabbage.

Chinese Communist Party (CCP) Political party founded in China in 1921 by Chen Duxiu and Li Dazhao. It grew directly from the reform-oriented May Fourth Movement and was aided from the start by Russian organizers. Under Russian guidance, the CCP held its First Congress in 1921; the Russians also invited many members to the Soviet Union for study and encouraged cooperation with the Chinese Nationalist Party. This cooperation lasted until 1927, when the communists were expelled. CCP fortunes declined rapidly after several failed attempts at uprisings, and the few members that remained fled to central China to regroup, where they formed a soviet-style government in Jiangxi. Harried by the Nationalist army under Chiang Kai-shek, the CCP forces undertook the Long March to northwestern China, when Mao Zedong became the party’s undisputed leader. War with the Japanese broke out in 1937 and led to a temporary alliance between the CCP and the Nationalists. After World War II, the CCP participated in U.S. -mediated talks with the Nationalists, but in 1947 the talks were abandoned and civil war resumed. The CCP increased its already strong rural base through land redistribution, and in 1949 it took control of mainland China. In the decades that followed, radical members led by Mao and moderates led initially by Liu Shaoqi vied for control of the party and the direction of China. After Mao’s death in 1976 the party moved steadily toward economic, if not political, liberalization. The government’s brutal suppression of student protesters at Tiananmen Square in 1989 produced a major shakeup in party leadership. Today the CCP sets policy, which government officials implement. The organs at the top of the CCP are the Political Bureau, the Political Bureau’s Standing Committee, and the Secretariat, among which the division of power is constantly shifting. See also Lin Biao; Zhou Enlai; Deng Xiaoping.

Chinese examination system In China, system of competitive examinations for recruiting officials that linked state and society and dominated education from the Song dynasty (960-1279) onward, though its roots date to the imperial university established in the Han dynasty (206

bc-ad 220). Candidates faced fierce competition in a series of exams dealing primarily with Confucian texts and conducted on the prefectural, provincial, and national levels. Despite a persistent tendency to emphasize rote learning over original thinking and form over substance, the exams managed to produce an elite grounded in a common body of teachings and to lend credibility to claims of meritocracy. Too inflexible to be capable of modernization, the system was finally abolished in 1905. See also Five Classics; Four Books.

Chinese languages or Sinitic languages Family of languages comprising one of the two branches of Sino-Tibetan. They are spoken by about 95% of the inhabitants of China and by many communities of Chinese immigrants elsewhere. Linguists regard the major dialect groups of Chinese as distinct languages, though because all Chinese write with a common system of ideograms, or characters (see Chinese writing system), and share Classical Chinese as a heritage, traditionally all varieties of Chinese are regarded as dialects. There is a primary division in Chinese languages between the so-called Mandarin dialects — which have a high degree of mutual intelligibility and cover all of the Chinese speech area north of the Yangtze River (Chang Jiang) and west of Hunan and Guangdong provinces — and a number of other dialect groups concentrated in southeastern China. Far more people — more than 885 million — speak a variety of Mandarin Chinese as a first language than any other language in the world. The northern Mandarin dialect of Beijing is the basis for Modem Standard Chinese, a spoken norm that serves as a supradialectal lingua franca. Important dialect groups other than Mandarin are Wu (spoken in Shanghai), Gan, Xiang, Min (spoken in Fujian and Taiwan), Yue (including Cantonese, spoken in Guangzhou [Canton] and Hong Kong), and Kejia (Hakka), spoken by the Hakka. The modern Chinese languages are tone languages, the number of tones varying from four in Modem Standard Chinese to nine in some dialects.

Chinese law Law that evolved in China from the earliest times until the 20th century, when Western socialist law (see Soviet law) was introduced. The oldest extant and complete Chinese law code was compiled in ad 653 during the Tang dynasty. Traditional Chinese law was influenced both by Confucianism, which allowed variability in moral conduct according to status and circumstances, and by Legalist, or Fajia, principles, which stressed reliance on uniform objective standards. The law also was affected by the emperor’s divine role in the universe. The emperor was considered responsible to heaven for any disturbance in the earthly sphere; whenever a disturbance occurred, punishment was considered a means of restoring the cosmic equilibrium. All citizens were obliged to denounce wrongdoers to the local magistrate’s office. The magistrate studied the facts of a case and, using the penal code, determined punishments, including beatings and torture. A profession of advocates, or lawyers, never developed in China. Traditional law continued to exert influence even after the communists gained power in China in 1949.

Chinese medicine, traditional System of medicine at least 23 centuries old that aims to prevent or heal disease by maintaining or restoring yin-yang balance. Detailed questions are asked about a patient’s illness and such things as taste, smell, and dreams, but close examination of the pulse, at different sites and times and with varying pressure, is paramount. Of Chinese medicine’s numerous remedies, Western medicine has adopted many, including iron (for anemia) and chaulmoogra oil (for leprosy). Use of certain animal remedies has seriously contributed to the endangered-species status of some animals (including tiger and rhinoceros). Chinese medicine used inoculation for smallpox long before Western medicine. Other practices include hydrotherapy, acupuncture, and ACUPRESSURE.

Chinese mustard See bok choy
Chinese Nationalists See Guomindang
Chinese New Year See New Year's Day

Chinese writing system System of symbols used to write the Chinese language. Chinese writing is fundamentally logographic: there is an exact correspondence between a single symbol, or character, in the script and a morpheme. Each character, no matter how complex, is fit into a hypothetical rectangle of the same size. The Chinese script is first attested in divinatory inscriptions incised on bone or tortoise shells dating from the Shang dynasty. Early forms of characters were often clearly pictorial or iconic. Shared elements of characters, called radicals, provide a means of classifying Chinese writing. It is thought that an ordinary literate Chinese

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person can recognize 3,000-4,000 characters. Efforts have been made to reduce the number of characters and to simplify their form, though the fact that they can be read by a speaker of any Chinese language and their inextricable link with China's 3,000-year-old culture makes abandonment of the system unlikely. Chinese characters have also been adapted to write Japanese, Korean, and Vietnamese.

Ch'ing dynasty See Qing dynasty
Chinggis Khan See Genghis Khan
Ch'ing-hai See Qinghai

Ch'ing-hai Hu See Koko Nor

chinoiserie \shen-'waz-re\ Fanciful European interpretations of Chinese styles in the design of interiors, furniture, pottery, textiles, and gardens. The expansion of trade with East Asia produced a lively vogue for Chinese fashions in the 17th– 18th centuries. The most outstanding chinoiserie interior was the Trianon de Porcelaine (1670-71), built for Louis XIV at Versailles. The style featured lavish gilding and lacquering, the use of blue and white (as in delftware), asymmetrical forms, unorthodox perspective, and Asian motifs. In the 19th century, the fashion gave way to Turkish and other styles considered exotic.

Chinook \sh9-'nuk\ Northwest Coast Indian people of Washington and Oregon, U.S. At the time of first contact, the Chinook – who were in fact composed of several smaller groups, including the Lower Chinook, the Clatsop, the Clackamas, and the Wasco – lived along the lower Columbia River and spoke Chinookan languages. They were famous as traders, with connections stretching as far as the Great Plains. They traded dried salmon, canoes, shells, and slaves. Chinook Jargon, the trade language of the Northwest Coast, was a combination of Chinook with Nootka and other Indian, English, and French terms. The Chinook were first described by the explorers Lewis and Clark, who encountered them in 1805. The basic social unit was the clan. Chinook religion focused on salmon rites and guardian spirits, and the potlatch was an important social ceremony. Following a smallpox epidemic in the early 19th century that brought about the collapse of Chinook culture, most of the remaining Chinook were absorbed into other Northwest Coast groups and many were

removed to reservations. Only some 600 individuals claimed sole Chinook descent in the 2000 U.S. census. In 2001 the Chinook gained federal recognition of tribal status.

chinook salmon or king salmon Prized North Pacific food and sport fish (Oncorhynchus tshawytscha) of the salmon family. The average weight is about 22 lbs (10 kg), but individuals of 50-80 lbs (22-36 kg) are not unusual. Chinook salmon are silvery, with round black spots. In fresh water they are found from the Amur River of Asia northward and, across the Bering Sea, southward to the Sacramento River of North America. Their range in the open ocean extends farther south. During spring spawning runs, adults swim as far as 2,000 mi (3,200 km) up the Yukon River, spawn, and then die. Young chinook salmon enter the sea when one to three years old. They were successfully introduced into Lake Michigan, creating a new sport fishery after the virtual elimination of lake trout by sea lampreys in the mid 20th century.

Chios Vkl-,as\ or Khios \'ke-os\ Island, Greece. It lies 5 mi (8 km) west of Turkey, in the Aegean Sea. Of volcanic origin, it is 30 mi (48 km) long and 8-15 mi (13-24 km) wide with an area of 321 sq mi (831 sq km). It was noted in antiquity as Homer’s birthplace. It was colonized by Ionians and became subject to Persia in 546 bc. Though later a member of the Delian League, it revolted several times against Athens. It prospered successively under Rome, Venice,

Genoa, and the Ottoman Empire; it passed to Greece after the Balkan Wars (1912-13). The city of Chios is the principal municipality.

chip, computer See computer chip,

INTEGRATED CIRCUIT

chipmunk Any of 17 species of terrestrial rodents in the squirrel family. The eastern chipmunk (Tamias

striatus), found in eastern North America, is 5. 5-7. 5 in. (14-19 cm) long, excluding a bushy, 3-4-in. (8-10-cm) tail. It is reddish brown with five black stripes alternating with two brown and two white stripes. The other species (all in the genus Eutamia) are found in western North America and central and eastern Asia. They are smaller and have different stripe patterns. Chipmunks are active burrow dwellers that eat primarily seeds, berries, and tender plants. They store seeds underground, carrying them in roomy cheek pockets. Their call is a shrill chirring or chipping sound.

Chippendale, Thomas (baptized June 5, 1718, Otley, Eng. — d. November 1779, London) English cabinetmaker. Little is known of his life before 1753, when he opened a showroom and workshop in London. In 1754 he published The Gentleman and Cabinet-Maker’s Director, a popular collection of designs illustrating almost every type of domestic furniture. The designs were mostly his improvements on already existing

styles. Though much 18th-century furniture is attributed to him, only a few pieces can be assigned with certainty to his workshop. See also Chippendale STYLE.

Chippendale style Style of furniture derived from designs by Thomas Chippendale. The term specifically refers to English furniture made in a modified Rococo style in the 1750s and ’60s, though Chippendale also designed furniture in Gothic and Chinese styles. Some of his designs are adapted from the Louis XV style. Furniture based on his designs was also made in Europe and the American colonies.

Chippewa See Ojibwa

Chippewa Vchi-po-.woV, Battle of (July 5, 1814) Engagement in the War of 1812 that restored U.S. military morale. After U.S. troops under Winfield Scott captured Fort Erie, N.Y., they began to push north into Canada. A British force marched south from Fort George and attacked them at Chippewa. The British were defeated, suffering 604 casualties to 335 for the U.S.

Chirac \she-'rak\, Jacques (Rene) (b. Nov. 29, 1932, Paris, France) President of France (from 1995). In 1967 he was elected to the National Assembly as a Gaullist. As prime minister (1974-76), he resigned over differences with Valery Giscard d'Estaing and formed a neo-Gaullist group, Rally for the Republic. As mayor of Paris (1977-95), he continued to build a conservative political base. His campaign for the presidency in 1981 split the conservative vote and allowed socialist Francois Mitterrand to win. Mitterrand later appointed Chirac prime minister (1986-88) in an unusual power-sharing arrangement after the right swept to victory in parliamentary elections. Although defeated again in presidential elections in 1988, Chirac won the presidency on his third try, in 1995. He was reelected in 2002 in a landslide victory over Jean-Marie Le Pen.

Chiricahua \,chir-i-'ka-w3\ National Monument Natural area, southeastern Arizona, U.S. Unusual volcanic rock formations forming a wilderness of tall pinnacles are crowded into 19 sq mi (48.5 sq km) of ridge and canyon on the western flank of the Chiricahua Mountains. Established in 1924, the park unfolds a geologic story dating back millions of years. The region was once a stronghold of Apache Indians under Cochise and Geronimo.

Chirico Vke-re-jkoX, Giorgio de (b. July 10, 1888, Volos, Greece — d. Nov. 19, 1978, Rome, Italy) Italian painter. Born to Italian parents in Greece, he studied art in Munich and began painting images juxtaposing the fantastic with the commonplace. In 1911 he moved to Paris, where he produced ominous scenes of deserted piazzas with Classical statues, isolated figures, and oppressive architecture. The element of mystery in his work exerted a great influence on Surrealism in the 1920s. He is known as the founder, with Carlo Carra and Giorgio Morandi, of Metaphysical

PAINTING.

Chiron \'kl-,ran\ In Greek mythology, one of the Centaurs. The son of Cronus and the sea nymph Philyra, he lived at the foot of Mount Pelion in Thessaly and was renowned for his wisdom and his knowledge of medicine. He was the teacher of many Greek heroes, including Achilles, Heracles, Jason, and Asclepius. Wounded accidentally by a poisoned arrow shot by Heracles, he was in such agony that he surrendered his immor-

tality in order to die. Zeus placed him among the stars as the constellation Sagittarius.

Chiron Comet once thought to be the most distant known asteroid. Discovered in 1977, it travels in an unstable, eccentric orbit between those of Saturn and Uranus. In 1989 astronomers detected a fuzzy cloud (coma)

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around Chiron. Because such a cloud is a defining feature of comets, Chiron was reclassified as a comet. See also Centaur object.

chiropractic Vkl-ro-.prak-tikA System of healing based on the theory that disease results from lack of normal nerve function, often caused by displaced vertebrae putting pressure on nerve roots. Treatment involves manipulations of body structures, primarily the spinal column, and use of other techniques when necessary. It concerns the relationship between musculoskeletal structures and functions of the body and the nervous system. The chiropractic method was propounded in 1895 by Daniel David Palmer (1845-1913). Practitioners are trained at accredited chiropractic colleges.

chisel Cutting tool with a sharpened edge at the end of a metal blade, used (often by driving with a mallet or hammer) in dressing, shaping, or working a solid material such as wood, stone, or metal. Flint ancestors of the chisel existed by 8000 bc; the ancient Egyptians used copper and later bronze chisels to work both wood and soft stone. Chisels today are made of steel, in various sizes and degrees of hardness, depending on use.

Chisholm, Shirley orig. Shirley Anita St. Hill (b. Nov. 30, 1924, Brooklyn, N.Y., U.S. — d. Jan. 1, 2005, Ormond Beach, Fla.) U.S. politician. A graduate of Columbia University (M.A., 1952), she was a schoolteacher before becoming active in local politics. Elected to the U.S. House of Representatives in 1968, she became the first African American woman to serve in Congress. During her 15 years in the House, she was known for her strong liberal views, including her opposition to U.S. involvement in the Vietnam War and her advocacy of full-employment programs. She cofounded the National Women’s Political Caucus. As a candidate for the Democratic Party’s 1972 U.S. presidential nomination, she won 152 delegates before withdrawing from the race.

Chisholm Trail \'chiz-am\ 19th-century route for cattle drives from Texas to Kansas, probably named for the trader Jesse Chisholm (1806?-1868?). The trail ran from south of San Antonio, across Oklahoma to Abilene, Kan., where a railhead was established in 1867. Between 1867 and 1871 1.5 million head of cattle were driven north over the trail to be shipped to markets in the East. After the 1880s the trail’s importance declined as other railheads were established.

Chisinau \,ke-she-'nau \ formerly (1812-1918, 1940-91) Kishinev Vki-shi-.nefN City (pop., 1999: 655,000), capital of Moldova. It lies on a tributary of the Dniester River. Ruled by Moldavia in the 15th century and taken by the Ottoman Turks in the 16th century, it was ceded to Russia in 1812. From 1918 the city was controlled by Romania; it was ceded back to the Soviet Union in 1940 and became the capital of the newly formed Moldavian S.S.R. The city is a commercial centre and the site of a university.

chitin Vkl-CnX White, homy substance found in the external skeleton of crabs, lobsters, and many insects; in internal structures of some other invertebrates; and in some fungi, algae, and yeasts. It is a polysaccharide, the monomer unit being glucosamine. It is used industrially in purifying wastewater, thickening and stabilizing foods and pharmaceuticals, and sizing and strengthening paper, and as a wound-healing agent, an ion-exchange resin, a membrane for industrial separations, and a binder for dyes, fabrics, and adhesives.

Chittagong \'chi-t3-,gaq\ City (pop., 2001 prelim.: city, 2,199,590; metro, area, 3,361,244), chief Indian Ocean port, Bangladesh. It is the country’s second most important industrial city, with jute mills, engineering works, and a large oil refinery. Known to Arab sailors by the 10th century ad, it was conquered by Muslims in the 14th century and occupied by the governor of Bengal in the 17th century. Ceded to Britain’s East India Company in 1760, it was constituted a municipality in 1864. Damaged in the conflict between India and Pakistan in 1971, its port facilities were rebuilt. It is the site of the University of Chittagong (founded 1966).

Ch'iu Ch'u-chi See Qiu Chuji

chivalry Vshi-v3l-re\ Knightly class of feudal Europe, and especially the gallantry and honor expected of medieval knights. The ideal of courteous knightly conduct developed in the 12th- 13th century. It arose out of feudal obligation (see feudalism) and stressed loyalty and obeisance by a knight to his God, his lord, and his lady, thus melding Christian and military virtues. Chivalry was greatly strengthened by the Crusades, a military endeavor on behalf of Christianity, which led to the founding of

the earliest orders of chivalry, the Knights of Malta and the Templars. In addition to loyalty and honor, the chivalric virtues included valor, piety, courtesy, and chastity. Questions of love and honor were combined in the ethos of courtly love. The knight’s lady was meant to be unobtainable, ensuring chastity; the feminine ideal thus became melded with the Virgin Mary. In the 14th— 1 5th century, chivalry came to be associated increasingly with aristocratic display and public ceremony, particularly in jousting tournaments, rather than with service in the field.

chive Small, hardy perennial plant (Allium schoenoprasum) of the lily family, related to the onion. Its small, white, elongated bulbs and thin, tubular leaves grow in clumps. Dense, attractive, spherical umbels of bluish or lilac flowers rise above the foliage. The leaves may be cut off at ground level and used for seasoning foods.

Chivington Massacre See Sand Creek Massacre

chlamydia \kb-'mi-de-9\ Any of the bacterial parasites that make up the genus Chlamydia, which cause several diseases in humans, including conjunctivitis and chlamydial pneumonia. One form causes a variety of sexually transmitted diseases. In men, symptoms are similar to those of gonorrhea. In women, chlamydial infection ordinarily produces few, if any, symptoms, and most infected women thus are unaware of their condition. However, untreated infections in women can lead to sterility, a higher risk of premature births, and ectopic pregnancies. Chlamydia frequently causes conjunctivitis or pneumonia in the newborn infant. Treatment is with antibiotics.

Chlamydomonas V.kla-mo-'da-mo-nosN Genus of single-celled green algae considered to be primitive life-forms of evolutionary significance. The cell has a spherical cellulose membrane, an eyespot, and a cup-shaped, pigment-containing chloroplast. Though capable of photosynthesis, Chlamydomonas may also absorb nutrients through the cell surface. It is found in soil, ponds, and ditches polluted by manure. It may colour water green. A red-pigmented species turns melting snow red.

chlorella \klo-'re-l3\ Any green algae of the genus Chlorella, found in fresh or salt water and in soil. They have a cup-shaped chloroplast. Chlorellas are used often in studies of photosynthesis, in mass cultivation experiments, and for purifying sewage wastes. Because they multiply rapidly and are rich in proteins and in B-complex vitamins, they have been studied as a potential food product for humans both on Earth and in outer space. Chlorella farms, closed systems that provide humans with food, water, and oxygen, have been established in the U.S., Japan, The Netherlands, Germany, and Israel.

chlorine Nonmetallic chemical element, chemical symbol Cl, atomic number 17. It is a toxic, corrosive, greenish yellow gas (as the diatomic molecule Cl 2) that severely irritates the eyes and respiratory system (and was used for that purpose as a chemical- warfare agent in World War I). As the chloride ion and in the hypochlorite ion, it has valence 1 ; in the chlorite, chlorate, and perchlorate ions, it has higher valences. Chlorine and its compounds are important industrial materials with myriad uses in the manufacture of other chlorinated compounds (e.g., PVC, hydrochloric acid, ethylene dichloride, trichloroethylene, PCBs), in water purification (municipal systems, swimming pools), in textile industries, in flame retardants, in special batteries, and in food processing. Sodium chloride (table salt) is by far the most familiar of its compounds. See also bleach.

chlorite Widespread group of layer silicate minerals composed of hydrous aluminum silicates, usually of magnesium and iron. The name, from the Greek for “green,” refers to chlorite’s typical colour. Chlorites have a silicate layer structure similar to that in micas. They characteristically occur as alteration products of other higher temperature minerals and are most common in sedimentary and igneous rocks and in some metamorphic rocks.

chloroethylene See vinyl chloride

chlorofluorocarbon (CFC) Any of several organic compounds con-

taining carbon, fluorine, chlorine, and hydrogen. A number of different CFCs have been made and sold under the trade name Freon. Developed

Wild chives (Allium schoenoprasum)

INGMAR HOLMASEN

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in the 1930s, these halogenated hydrocarbons were widely used as refrigerants and aerosol propellants and in other applications because they are nontoxic and nonflammable and readily evaporate and condense. However, CFCs released into the atmosphere rise into the stratosphere, where solar radiation breaks them down; the chlorine released reacts with ozone, depleting the ozone layer. In 1992 most developed countries agreed to end CFC production by 1996; 1997 production, weighted according to the ozone depletion potential of each CFC, was 10% of peak (1988) production.

chloroform Clear, colourless, heavy, nonflammable liquid organic compound with a pleasant etherlike odour, chemical formula CHC1 3 . It was the first substance successfully used as a surgical anesthetic (1847); being somewhat toxic, it has been increasingly displaced by other substances for this purpose. It has some industrial uses, primarily as a solvent.

chlorophyll Any member of one of the most important classes of pigment molecules involved in photosynthesis. Found in almost all photosynthetic organisms, it consists of a central magnesium atom surrounded by a nitrogen-containing structure called a porphyrin ring, to which is attached a long carbon-hydrogen side chain, known as a phytol chain. In structure it is remarkably similar to hemoglobin. Chlorophyll uses energy that it absorbs from light to convert carbon dioxide to carbohydrates. In higher plants it is found in chloroplasts.

chloroplast Microscopic, ellipsoidal organelle in a green plant cell. It is the site of photosynthesis. It is distinguished by its green colour, caused by the presence of chlorophyll. It contains disk-shaped structures called thylakoids that make possible the formation of ATP, an energy-rich storage compound.

Internal structures of the chloroplast. The interior contains flattened sacs of photosynthetic membranes (thylakoids) formed by the invagination and fusion of the inner membrane. Thylakoids are usually arranged in stacks (grana) and contain the photosynthetic pigment (chlorophyll). The grana are connected to other stacks by simple membranes (lamellae) within the stroma, the fluid proteinaceous portion containing the enzymes essential for the photosynthetic dark reaction, or Calvin cycle.

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Chlotar \'klo-,tar\ I (b. c. 500? – d. late 561, Compiegne, Fr.) Merovingian king of Soissons from 511 and of the whole Frankish kingdom from 558. (See Merovingian dynasty.) The youngest son of Clovis I, he shared in the partition of his father’s kingdom in 511 and extended his lands by murder and intrigue. He launched campaigns against the Burgundians (523, 532-34), the Visigoths (532, 542), and the Thuringians (c. 531). A ruthless and brutal ruler, Chlotar put to death his rebellious son Chram with his family (560).

Chobe Vcho-ba\ National Park National preserve, northern Botswana. The preserve, which acquired national park status in 1968, borders Namibia and touches Zimbabwe and Zambia, covering 4,500 sq mi (1 1,700 sq km). It is noted for its wildlife, particularly its large elephant population.

chocolate Food prepared from ground roasted cacao beans. It is consumed as candy, used to make beverages, and added as a flavouring or coating for confections and baked products. It was introduced to Europe by Hernan Cortes following his visit in 1519 to the court of Montezuma

II. who served the conquistador a bitter cacao-bean drink, xocoatl. In making chocolate, the kernels of fermented and roasted cacao beans are ground into a paste called chocolate liquor, which may be hardened in molds to form baking (bitter) chocolate, pressed to reduce the cocoa butter (vegetable fat) content and then pulverized to make cocoa powder, or mixed with sugar and additional cocoa butter to make sweet (eating) chocolate. The addition of concentrated milk to sweet chocolate produces milk chocolate. White chocolate, made from cocoa butter, sugar, milk, and vanilla, contains no cocoa solids. Rich in carbohydrates and fat and containing small amounts of caffeine, chocolate is an excellent source of quick energy.

Choctaw North American Indian people living in Oklahoma, U.S. They speak a Muskogean language that is closely related to that of the Chickasaw. The Choctaw once lived in what is now southeastern Mississippi. They were the most skillful of the southeastern farmers, usually having surplus produce to sell or trade. They fished, gathered nuts and wild fruits, hunted deer and bear, and planted com, beans, and pumpkins. Their principal religious ceremony was the Busk (Green Corn) festival, a first-fruits and new-fire rite celebrated at midsummer. In the 19th century, pressure by white cotton-growers forced them to cede five million acres, and most Choctaw were removed to Oklahoma. Some 87,300 individuals claimed sole Choctaw descent in the 2000 U.S. census.

Ch'oe Si-hydng Vchoe-'se-’yoqV (b. 1827, Korea — d. 1898, Seoul) Second leader of the Korean Tonghak (now Ch'ondogyo) religion. He organized the underground network that spread the apocalyptic, antiforeign Tonghak sect following the execution of its founder, Ch’oe Che-u (1824-64). He published the first two Tonghak scriptures in 1880 and 1881, adding public service to the founder’s principle of human equality and obligation to serve heaven. Preaching the need for Korea to become as strong as Western imperialist powers, in 1894 he led the Tonghak Uprising, which was viciously suppressed. He was arrested and executed in 1898, by which time Tonghak had spread throughout Korea.

choir Body of singers with more than one voice to a part. For many centuries, church choirs sang only plainsong (see Gregorian chant). The relative complexity of early polyphony required solo voices rather than choral performance, but by the 15th century polyphony was being performed chorally. The growth of the secular choir (or chorus) coincided with the beginnings of opera. An oratorio choir is part of a different tradition, which stems from the augmented church choirs used to provide choral portions of a given oratorio, whether performed in or out of church.

Choiseul \shwa-'z3l\, Etienne-Francois de Choiseul, duke de

(b. June 28, 1719, Lorraine, France — d. May 8, 1785, Paris) French foreign minister. He served with distinction in the War of the Austrian Succession. After serving as ambassador to the Vatican (1753-57) and to the Austrian court, he was made a duke and named minister of foreign affairs (1758), in which position he came to dominate the government of Louis XV. In 1761 he concluded a military alliance with Spain (the “Family Compact”), and at the end of the Seven Years’ War he negotiated the best terms for a defeated France. He rebuilt France’s military strength but was dismissed from office in 1770 for advocating war against Britain.

chokecherry One of several varieties of shrub or small tree (Prunus virginiana) of the rose family, native to North America. Though it is aptly named for the astringent, acidic taste of its reddish cherries, its fruit may be made into jelly and preserves. The stones and wilted foliage are poisonous. The trees often form dense thickets on moist soils. They are frequently attacked and defoliated by eastern tent caterpillars. Foul-scented white flowers are produced in hanging spikes, and the slender brown twigs also have an unpleasant odour and a bitter taste.

cholera Vka-b-roX Acute bacterial infection with Vibrio cholerae, causing massive diarrhea with severe depletion of body fluids and salts. (See bacterial disease.) Cholera often occurs in epidemics, spreading in con-

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taminated water or food. The bacteria secrete a toxin that causes the diarrhea, which along with vomiting leads to dehydration, with severe muscle

cramps and intense thirst. Stupor and coma may precede death by shock. With fluid and salt replacement, the disease passes in two to seven days, sooner if antibiotics are taken the first day. Prevention requires good sanitation, especially clean drinking water.

cholesterol Waxy organic compound found in blood and all animal tissues. It is a steroid, with molecular formula C 27 H 46 0, containing four rings in its structure. Cholesterol is essential to life; it is a primary component of CELL membranes and a starting or intermediate material from which the body makes bile acids, other steroid hormones, and vitamin D. It is made in the liver and some other organs, in greater or lesser amounts depending on the amount recently consumed in the diet. It circulates in the blood in compounds called lipoproteins, since it is not water-soluble alone. Excess cholesterol in the blood forms deposits in arteries (see arteriosclerosis), which can lead to coronary heart disease. Michael Brown (born 1941) and Joseph Goldstein (bom 1940) won a Nobel Prize in 1985 for their work in discovering this process. Since the body makes cholesterol from FATS, blood cholesterol cannot be reduced by limiting only the amount of cholesterol in the diet; the amount of fat, especially saturated fat (see saturation, fatty acid) must also be reduced. See also triglyceride.

choline Vko-,len\ Organic compound related to vitamins in its activity. It is important in metabolism as a component of the lipids that make up cell membranes and of acetylcholine. It is also important as a source of chemical raw materials for cells and in transport of fats from the liver. It is usually classified with the B vitamins (see vitamin B complex) because it resembles them in function and in its distribution in foods. In humans it is interconvertible with certain other compounds, such as methionine, so deficiency does not lead to disease, but some other animals need it in their diet. Choline has various uses in medicine, nutrition, and the processing of foods and feeds.

cholla Vchoi-y9\ Any cactus of the genus Opuntia, native to North and South America, having needlelike spines partly enclosed in a papery sheath. Chollas vary greatly in size and have small flowers, sometimes chartreuse and inconspicuous, but usually of more striking colors. O. leptocaulis, the desert Christmas cactus, bears bright red fruits through the winter. Living plants serve as food for desert animals. Cholla wood, a hollow cylinder with regularly spaced holes, is used for fuel and novelties. Some cholla fruit is edible.

Chomsky, (Avram) Noam (b.

Dec. 7, 1928, Philadelphia, Pa.,

U.S.) U.S. linguist, philosopher, and political activist. He received a Ph.D. in linguistics from the University of Pennsylvania in 1955, the same year he joined the faculty at the Massachusetts Institute of Technology (MIT). Chomsky takes the proper object of study for linguistics to be the mentally represented grammars that con-

stitute the native speaker’s knowledge of his language and the biologically innate language faculty, or “universal grammar,” that enables the developmentally normal language learner, as a child, to construct a grammar of the language to which he is exposed. For Chomsky, the ultimate goal of linguistic science is to develop a theory of universal grammar that provides a descriptively adequate grammar for any natural language given only the kind of “primary linguistic data” available in the social environments of children. This imperative has motivated the gradual refinement of Chomskyan linguistic theory from the early transformational grammar of the 1950s and ’60s to the Minimalist Program of the 1990s and beyond. A self-described libertarian socialist, Chomsky has written numerous books and lectured widely on what he considers the antidemocratic character of American capitalism and its pernicious influence on the country’s politics and foreign policy, mass media, and academic and intellectual culture. See also generative grammar.

Ch'ondogyo Vchdn-'d6-gyd\ formerly Tonghak (Korean: "Eastern Learning") Korean "Religion of the Heavenly Way"

Korean religion combining elements of Confucianism, Buddhism, Daoism, shamanism, and Roman Catholicism. Its basic principle that “man and God are one” is realized through faith in the unity of one’s body and spirit and in the universality of God. Converts are instructed to meditate on God, pray upon leaving and entering home, dispel harmful thoughts, and worship God in church on Sundays. Ch’oe Che-u (1824-64) established the religion in 1860 after receiving inspiration from the Heavenly Emperor (Ch’ongju). His efforts at social change led to his execution. His successor, Ch'oe Si-hyong, was executed following the Tonghak Uprising. Today Ch’ondogyo has about three million adherents.

Chongqing or Ch'ung-ch'ing Vchuq-'chiqV conventional Chungking \'ch3q-'kii]\ City and municipality with provincial status (pop., 2003 est.: city, 4,239,700; 2002 est.: municipality, 31,070,000), south-central China. The municipality is bordered by Sichuan, Shaanxi, Hubei, Hunan, and Guizhou provinces and has an area of 31,700 sq mi (82,000 sq km). The leading river port and industrial centre of the region, Chongqing (“Double-Blessed”) lies at the confluence of the Yangtze (Chang) and Jialing rivers. In the 11th century bc it was a feudal state under the Xi (Western) Zhou dynasty. Over the next several centuries its status alternated from being ruled by an empire in northern China to being an independent state. It finally came under Chinese rule in the Ming dynasty, continuing under the Qing dynasty. It was opened to foreign trade in 1890. It played a large role in the revolution of 1911. Once a city of narrow and irregular streets, Chongqing changed greatly as a result of a modernization program introduced during World War II, when it became the capital of Nationalist China. Since the war it has become an important industrial centre. It is home to Chongqing University (founded 1929).

Chons See Khons

Chopin \sho-'pa n ,\ English \ 'sho-.panV, Frederic (Francois) orig. Fryaeryk Franciszek Szopen

(b. March 1, 1810, Zelazowa Wola, near Warsaw, Duchy of Warsaw — d. Oct. 17, 1849, Paris, France) Polish-

French composer. Born to middle-class French parents in Poland, he published his first composition at age seven and began performing in aristocratic salons at eight. He moved to Paris in 1831, and his first Paris concert the next year thrust him into the realm of celebrity. Renowned as a piano teacher, he spent his time in the highest society. He contracted tuberculosis apparently in the 1830s.

In 1837 he began a 10-year liaison with the writer George Sand; she left him in 1847, and a rapid decline led to his death two years later. Chopin stands not only as Poland’s greatest composer but perhaps as the most significant composer in the history of the piano; he exhaustively exploited the instrument’s capacities for charm, excitement, variety, and timbral beauty. His innovations in fingering, his use of the pedals, and his general treatment of the keyboard were hightly influential. Apart from two piano concertos (both 1 830) and four other works for piano and orchestra, virtually all his compositions are for solo piano; they include some 60 mazurkas, 27 etudes, 26 preludes, 21 nocturnes, some 20 waltzes, 16 polonaises, 4 ballades, 4 scherzos, and 3 sonatas.

Chopin \sho-'pan\, Kate orig. Katherine O'Flaherty (b. Feb. 8, 1851, St. Louis, Mo., U.S. — d. Aug. 22, 1904, St. Louis) U.S. writer. Chopin lived in Louisiana during her marriage and began to write after her husband’s death. A local colourist and interpreter of New Orleans culture, she foreshadowed later feminist themes. Among her more than 100 short stories are “Desiree’s Baby” and “Madame Celestin’s Divorce.” The Awakening (1899), a realistic novel about the sexual and artistic awakening of a young mother who abandons her family, initially was condemned for its sexual frankness but was later acclaimed.

chorale Metrical hymn tune associated in common English usage with the Lutheran church in Germany. From early in the Reformation, chorales were to be sung by the congregation during the Protestant liturgy. The

Jumping cholla [Opuntia bigelovii)

GRANT HEILMAN

Frederic Chopin, detail of a portrait by Eugene Delacroix; in the Louvre in Paris, France.

GIRAUDON/ART RESOURCE, NEW VORK

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words of the Lutheran chorales were often Latin plainsong hymn texts translated into the vernacular. The melodies were often borrowed from secular song and therefore displayed great melodic and structural simplicity. In modern times the chorale is considered to be a musical setting, usually polyphonic (multivoiced), of a traditional religious text.

chord Grouping of three or more musical tones, especially as sounded simultaneously. The tones C-E-G constitute a “C major chord,” or “C major triad.” Chords may comprise any number of separate tones, and may be highly dissonant (see consonance and dissonance). The term harmony is often used loosely as a synonym.

chordate Vk6r-,dat\ Any member of the phylum Chordata, which includes the most highly evolved animals, the vertebrates, as well as the marine invertebrate cephalochordates (see amphioxus) and tunicates. All chordates, at some time in their life cycle, possess a dorsal supporting rod (notochord), gill slits, and a dorsal nerve cord. Unlike vertebrates, tunicates and cephalochordates lack any kind of brain or skeleton. Chordate bodies consist of a body wall encasing a gut, with a space between called the coelom. The body is usually long and bilaterally symmetrical, with the mouth and sense organs at the front end.

chorea \ko-'re-3\ Neurological disorder causing irregular, involuntary, purposeless movements. It is believed to be caused by degeneration of the basal ganglia in the cerebral cortex. Sydenham chorea (St. Vitus dance) is usually associated with rheumatic fever. It usually occurs between ages 5 and 15, more often in girls. Typical jerking movements, mostly in the extremities and face, may affect speech and swallowing and range from mild to incapacitating; attacks last several weeks and recur frequently. Senile chorea, a progressive disease resembling Sydenham chorea, usually occurs late in life. Huntington chorea is rare, hereditary, and fatal. It usually begins between ages 35 and 50 and progresses to random, often violent, and eventually totally incapacitating spasms, absent only during sleep. Mental deterioration begins later, and death occurs in 10-20 years. There is no effective therapy. Children of those afflicted have a 50% chance of developing the illness.

choreography Art of creating and arranging dances. The word is derived from the Greek for “dance” and “write,” reflecting its early meaning as a written record of dances. By the 19th century the term was used mainly for the creation of dances, and the written record became known as dance notation. In the 16th century dance masters at the French court arranged their social dances into specific patterns. In the 17th century such dances became more complex and were performed as theatrical ballets by trained professionals. In the late 18th century Jean-Georges Noverre and Gasparo Angiouni introduced choreography that combined expressive mime and dance steps to produce the dramatic ballet. This was further developed in 19th-century Romantic ballets by Marius Petipa, Jules Perrot, and August Bournonville. Radical change in the 20th century began with

choreographers of the Ballets Russes, including Michel Fokine and Leonide Massine, and continued with George Balanchine, Martha Graham, Frederick Ashton, Jerome Robbins, Merce Cunningham, and Twyla Tharp. See also Alvin Ailey; Agnes de Mille; Serge Lifar; Bronislava Nijinska; Salvatore Vigano.

chorus In theatre, a group of actors, singers, or dancers who perform as an ensemble to describe and comment on a play’s action. Choral performances, which originated in the singing of dithyrambs in honour of Dionysus, dominated Greek drama until the mid-5th century bc, when Aeschylus added a second actor and reduced the chorus from 50 to 12 performers. As the importance of individual actors increased, the chorus gradually disappeared. It was revived in modern plays such as Eugene O'Neill’s Mourning Becomes Electra (1931) and T.S. Eliot’s Murder in the Cathedral (1935). Choruses of singers and dancers came to be featured in musical comedies, especially in the 20th century, first as entertainment and later to help develop the plot.

Choshu Vcho-.shiA Japanese han (domain) that, along with the han of Satsuma, supported the overthrow of the Tokugawa shogunate (see Tokugawa period) and the creation of a new government headed by the emperor. With their superior familiarity with Western weapons, the Satsuma-Choshu alliance was able to defeat the shogunal forces, bringing the emperor to power in the Meiji Restoration of 1868.

Choson dynasty \'cho-,s6n\ or Yi dynasty (1392-1910) Last and longest-lived of Korea’s dynasties. Chinese cultural influences were intense in this period, when Neo-Confucianism was adopted as the ideol-

ogy of the state and society. In the late 16th and early 17th centuries, Korea suffered invasions at the hands of the Japanese and Manchus. Many cultural assets were lost, and it took the country nearly a century to recover. At the end of the 19th century, foreign powers once again threatened Korea; it was annexed by Japan in 1910. During the Choson dynasty the Korean alphabetic script Hangul (see Korean language) was created, and the yangban, a new aristocracy, was established. See also Yi Song-gye.

Chott el-Hodna See Chott el-HoDNA
Chou dynasty See Zhou dynasty
Chou En-lai See Zhou Enlai
Chou-kung See Zhougong

Chouteau \shu-'to\, (Rene) Auguste (baptized Sept. 7, 1749, New Orelans — d. Feb. 24, 1829, St. Louis, Mo., U.S.) American fur trader and cofounder of St. Louis. He moved to Missouri Territory with his mother and Pierre Liguest (17247-78), with whom he later cofounded St. Louis in 1764. The two men built a prosperous fur trade, which Chouteau later expanded. By 1794 he had a monopoly on the trade with the Osage and helped finance most of the fur-trading companies in Louisiana Territory. He became the unofficial banker to the St. Louis community and its largest landowner.

chow chow or chow Breed of dog that shares with the shar-pei an unusual blue-black tongue. The chow chow originated in China and dates to the Han dynasty (206 bc-ad 220); it may be one of the oldest of

all dog breeds. It is compact and has a large head and a thick coat that forms a dense ruff about the neck.

The coat is evenly coloured, either reddish brown, black, or blue-gray.

The adult stands about 18-20 in.

(46-5 1 cm) tall and weighs 45-70 lb (20-32 kg). The breed is usually loyal to owners but aloof with strangers. Chow chow

SALLY ANNE THOMPSON/EB INC.

Chretien \kra-'tyaii\, (Joseph-

Jacques) Jean (b. Jan. 11, 1934, Shawinigan, Quebec, Can.) Canadian prime minister (1993-2003). The 18th of 19 children of a working-class family, Chretien studied law at Laval University and was called to the bar in Quebec in 1958. He served in the Canadian House of Commons (1963—86) and held various posts in the administrations of Lester Pearson and Pierre Trudeau, including minister of finance (1977), the first French Canadian to hold the office. In 1986, after losing the leadership battle to succeed Trudeau, he retired from parliament. Four years later he was reelected to the House of Commons and became leader of the Liberal Party of Canada. In 1993 the Liberals won a landslide victory, and Chretien became prime minister. Under his leadership the party was again victorious in 1997 and 2000. As prime minister, he oversaw in 1998 the passage of the country’s first balanced budget since 1970, and he pursued progressive social reforms, drafting a law in 2003 that would recognize same-sex marriages. Chretien’s relationship with the U.S. was sometimes tense, and he refused to commit Canadian troops to the U.S. -led war against Iraq in 2003.

Chretien de Troyes \kra-'tya n -d3-'trwa\ (fl. 1165-80) French poet. Little is known of his life. He is the author of the five Arthurian romances Erec, Cliges, Lancelot , Yvain, and Perceval and possibly also of a non-Arthurian tale. Written in the vernacular, his romances were derived from the writings of Geoffrey of Monmouth and combine separate adventures into well-knit stories. They were imitated almost immediately by other French poets and were translated and adapted frequently as the romance continued to develop as a narrative form. See also Arthurian legend.

Christ, Church of Any of various conservative Protestant churches found mainly in the U.S. Each congregation is autonomous in government, with elders, deacons, and a minister or ministers; there is no national administrative organization. These churches originated in the early 19th century with the Disciples of Christ movement, which relied on the Bible as the only standard of Christian faith and worship. Controversies split the movement, and the Churches of Christ designated those congregations that opposed organized mission societies and the use of instrumental

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music in worship. After their separation from the Disciples, the Churches of Christ continued to grow. Worship services consist of prayer, preaching, unaccompanied singing, and the Lord's Supper.

Christchurch City (pop., 1999 est.: 324,200), South Island, New Zealand. Founded in 1 850 as a model Church of England settlement, it was the last and most successful colonizing project inspired by Edward Gibbon Wakefield and his New Zealand Co. It is the country's second largest city and an important industrial centre; its port is Lyttelton. Called the "Garden City of the Plains" for its numerous parks and gardens, it is home to the University of Canterbury, Christ's College, and Lincoln University.

Christian II (b. July 1, 1481, Nyborg, Den. — d. Jan. 25, 1559, Kalundborg) King of Denmark and Norway (1513-23) and of Sweden (1520-23). He succeeded his father, John, as king of Denmark and Norway. In 1517 he invaded Sweden, defeating the forces of the Swedish regent, and was crowned Sweden's king in 1520. However, he ordered a massacre of Swedish nobles (the Stockholm Bloodbath) that helped incite a successful Swedish war for independence, marking the end of the Kalmar Union in 1523. That year a revolt in Denmark forced Christian to flee to the Netherlands. After attempting to regain his kingdom, he was arrested by Danish forces in 1532 and spent the rest of his life imprisoned in Danish castles.

Christian III (b. Aug. 12, 1503, Gottorp, Schleswig — d. Jan. 1, 1559, Kolding, Den.) King of Denmark and Norway (1534-59). Son of King Frederick I, he assumed control of the kingdom after winning a civil war known as the Count's War. He arrested the Catholic bishops who had opposed him and organized the Diet of Copenhagen (1536), which confiscated episcopal property and established the state Lutheran church. By forming close ties between the church and the crown, he laid the foundation for the absolutist Danish monarchy of the 17th century.

Christian IV (b. April 12, 1577, Frederiksborg Castle, Hillerpd, Den. — d. Feb. 28, 1648, Copenhagen) King of Denmark and Norway (1588-1648). He succeeded to the throne on the death of his father,

Frederick II, but a regency ruled until 1596. After his coronation he succeeded in limiting the powers of the Rigsrad (state council). He led two unsuccessful wars against Sweden and brought disaster to his country by leading it into the Thirty Years'

War. He was eventually forced to accept the increased power of the nobility, which had long opposed his warlike policies. However, he ener-

getically promoted trade and shipping, was a great builder and founder of cities, left a national heritage of fine buildings, and was considered one of the most popular of Danish kings.

Christian IX (b. April 8, 1818, Gottorp, Schleswig — d. Jan. 29, 1906, Copenhagen, Den.) King of Denmark (1863-1906). He succeeded the childless Frederick VII, whose cousin he had married. When he became king, he was forced by popular feeling to sign the November Constitution, which incorporated Schleswig into the state (see Schleswig-Holstein Question). This led to the disastrous war of 1864 against Prussia and Austria. After the war, he unsuccessfully resisted the advance of full parliamentary government in Denmark.

Christian X (b. Sept. 26, 1870, Charlottenlund, Den. — d. April 20, 1947, Copenhagen) King of Denmark (1912 — 47) who symbolized his nation's resistance to the German occupation in World War II. He assumed the throne on the death of his father, Frederick VIII (1843-1912). In 1915 Christian signed a constitution granting equal suffrage to men and women. After the German occupation began in 1940, he rode frequently on horseback through the streets of Copenhagen, showing that he had not abandoned his claim to national sovereignty, and he opposed Nazi demands for anti-Jewish legislation. His speech against the occupation forces in 1943 led to his imprisonment until the end of the war.

Christian, Charlie orig. Charles Christian (b. July 29, 1916, Bonham, Texas, U.S. — d. March 2, 1942, New York, N.Y.) U.S. guitarist. Christian grew up in Oklahoma City, Okla., and joined Benny Goodman to perform in both big-band and small-group settings in 1939. He created a sensation through his technically adept and innovative use of amplification, thus changing the guitar's primary role from accompanist to soloist. He was the first great electric guitarist in jazz. As one of the most advanced and influential soloists of the swing era, Christian participated in the jam sessions at Minton's Playhouse in Harlem with Thelonious Monk and Dizzy Gillespie that pioneered the harmonic advances of bebop.

Christian caste In India, social stratification among Christians based on caste membership at the time of an individual's or an ancestor's conversion. Indian Christians are grouped by denomination, geography, and caste. The Syrian Christians along the Malabar coast, descended from lst-century converts of high birth, retain mid-rank status in Hindu society. Portuguese missionaries of the 16th century converted lower-caste fisherfolk. Missionaries in the 19th century insisted on social reform and tended to draw from the lowest classes. Caste distinctions are breaking down at about the same rate among contemporary Indian Christians and other Indians.

Christian Democracy Political movement that has a close association with Roman Catholicism and its philosophy of social and economic justice. It incorporates both traditional church and family values and progressive values such as social welfare. After World War II, a number of Christian Democrat parties appeared in Europe, including the Italian

Christian Democratic Party, the French Popular Republican Movement, and the most successful, the German Christian Democratic Union. The same period also saw the appearance of Christian Democrat parties in Latin America. Though most were small splinter groups, Christian Democrats eventually achieved power in Venezuela, El Salvador, and Chile.

Christian Democratic Party (Italy) See Italian Popular Party

Christian Democratic Union (CDU) German political party advocating a free-market economy, limited social-welfare programs, and close relations with the United States. The CDU was founded in 1945 by a diverse group of former Weimar Republic (1919-33) politicians, including activists in the old Roman Catholic Centre Party, liberal and conservative Protestants, workers, intellectuals, and segments of the middle class. It held power from the establishment of the West German republic in 1949 until 1969. It regained power in 1982 under Helmut Kohl, who remained chancellor until 1998. In 1990 Kohl oversaw the reunification of Germany. The party is a strong supporter of European integration. See also Konrad Adenauer; Christian Democracy.

Christian Science officially Church of Christ, Scientist Religious denomination founded in the U.S. in 1879 by Mary Baker Eddy. Like other Christian churches, Christian Science subscribes to an omnipotent God and the authority (but not inerrancy) of the Bible and takes the Crucifixion and Resurrection of Jesus as essential to human redemption. It departs from traditional Christianity in considering Jesus divine but not a deity and in regarding creation as wholly spiritual. Sin denies God’s sovereignty by claiming that life derives from matter. Spiritual cure of disease is a necessary element of redemption from the flesh and one of the church’s most controversial practices. Most members refuse medical help for disease, and members engaged in the full-time healing ministry are called Christian Science practitioners. Elected readers lead Sunday services based on readings from the Bible and Eddy’s Science and Health with Key to the Scriptures. At the end of the 20th century, the church had about 2,500 congregations in 70 countries; its headquarters is at the Mother Church in Boston. See also New Thought.

Christian Science Monitor, The Daily newspaper of national and international news and features, published Monday through Friday in Boston under the auspices of the Church of Christ, Scientist (see Christian Science). Established in 1908 at the urging of Mary Baker Eddy as a protest against the sensationalism of the popular press, it became one of the most respected U.S. newspapers, famous for its thoughtful treatment of the news and for the quality of its assessments of political, social, and economic developments. It strictly limits the kinds of advertising it accepts. It maintains its own bureaus to gather news abroad and publishes a weekly world edition. The newspaper won its sixth Pulitzer Prize in 1996, in the category of international reporting.

Christian Social Union (CSU) Conservative German political party that was founded in Bavaria, West Germany, in 1946 by Roman Catholic

Christian IV, detail of an oil painting by Pieter Isaacsz, 1612; in Frederiksborg Castle, Denmark

COURTESY OF DET NATIONALHISTORISKE MUSEUM PA
FREDERIKSBORG, DEN.

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and Protestant groups. It was committed to free enterprise, federalism, and a united Europe that would operate under Christian principles. From 1946 it held the government of Bavaria continuously, except in 1954-57. In national elections it usually cooperated with the Christian Democratic Union.

Christian socialism Social and political movement originating in mid- 19th-century Europe. Christian socialists attempted to combine the fundamental aims of socialism with the religious and ethical convictions of Christianity, promoting cooperation over competition as a means of helping the poor. The term was coined in Britain in 1 848 after the failure of the reform movement known as Chartism. Christian socialism found followers in France and Germany, though the German group, led by Adolf Stoecker, combined its activities with violent anti-Semitism. Although the movement died out in the U.S. in the early 20th century, it retains an important following in Europe.

Christiania See Oslo

Christianity Religion stemming from the teachings of Jesus in the 1st century ad. Its sacred scripture is the Bible, particularly the New Testament. Its principal tenets are that Jesus is the Son of God (the second person of the Holy Trinity), that God’s love for the world is the essential component of his being, and that Jesus died to redeem humankind. Christianity was originally a movement of Jews who accepted Jesus as the Messiah, but the movement quickly became predominantly Gentile. The early church was shaped by St. Paul and other Christian missionaries and theologians; it was persecuted under the Roman Empire but supported by Constantine I, the first Christian emperor. In medieval and early modern Europe, Christian thinkers such as St. Augustine, Thomas Aquinas, and Martin Luther contributed to the growth of Christian theology, and beginning in the 15th century missionaries spread the faith thr oughout much of the world. The major divisions of Christianity are Roman Catholicism, Eastern Orthodoxy, and Protestantism. Nearly all Christian churches have an ordained clergy, members of which are typically though not universally male. Members of the clergy lead group worship services and are viewed as intermediaries between the laity and the divine in some churches. Most Christian churches administer two sacraments, baptism and the Eucharist. In the early 21st century there were more than two billion adherents of Christianity throughout the world, found on all continents.

Christie, Dame Agatha (Mary Clarissa) (b. Sept. 15, 1890, Torquay, Devon, Eng. — d. Jan. 12,

1976, Wallingford, Oxfordshire)

British detective novelist and playwright. Her first novel, The Mysterious Affair at Styles (1920), introduced Hercule Poirot, the eccentric Belgian detective who would appear in about 25 novels.

The elderly spinster Miss Jane Marpie, her other principal detective figure, first appeared in Murder at the Vicarage (1930). Most of her approximately 75 novels, such as Murder on the Orient Express (1933; film, 1978), were best-sellers; translated into 100 languages, they have sold more than 100 million copies. Her plays include The Mousetrap (1952), which set a world record for longest continuous run, and Witness for the Prosecution (1953; film, 1958). She was married to the eminent archaeologist Sir Max Mallowan (1904-78).

Christie's Popular name for the London firm of Christie, Manson & Woods, the oldest fine-arts auctioneers in the world. It was founded by James Christie (1730-1803), who opened his salesrooms in 1766. He became friends with Joshua Reynolds and Thomas Gainsborough, among others, and developed a tradition of holding studio sales for prominent artists. Christie’s has handled some of the most important art sales in history, including the sale of paintings to Catherine II the Great of Russia. The firm, which became a public company in 1973, now has branches all over the world.

Christina Swedish Kristina (b. Dec. 8, 1626, Stockholm, Swed. — d. April 19, 1689, Rome) Queen of Sweden (1644-54). The successor to her father, Gustav II Adolf, she was a prime mover in concluding the Peace of Westphalia and ending the Thirty Years' War. After 10 years of rule, she

stunned Europe by abdicating the throne, claiming that she was ill and that the burden of ruling was too heavy for a woman. Her real reasons were her aversion to marriage and her secret conversion to Roman Catholicism, which was proscribed in Sweden. She moved to Rome and subsequently attempted, without success, to gain the crowns of Naples and Poland. One of the wittiest and most learned women of her age, she was a lavish patroness of the arts and an influence on European culture.

Christine de Pisan or Christine de Pizan \kres-'ten-do-pe-'za n \ (b. 1364, Venice — d. c. 1430)

French writer. She was the daughter of an astrologer to Charles V and the wife of a court secretary and took up

writing to support her children when she was widowed, producing 10 volumes of graceful verse, including ballads, rondeaux, lays, and complaints, many in the courtly-love tradition. Some works, both poetry and prose, champion women, notably The Book of the City of Ladies (1405). She also wrote a life of Charles V and Le Ditie de Jehanne d'Arc (1429), inspired by Joan of Arc's early victories.

Christmas Christian festival celebrated on December 25, commemorating the birth of Jesus. December 25 had already been identified by Sextus Julius Africanus in ad 221 as the day on which Christmas would be celebrated, and it was celebrated in Rome by ad 336. During the Middle Ages Christmas became extremely popular, and various liturgical celebrations of the holiday were established. The practice of exchanging gifts had begun by the 15th century. The Yule log, cakes, and fir trees derive from German and Celtic customs. Christmas today is regarded as a family festival with gifts brought by Santa Claus (see St. Nicholas). As an increasingly secular festival, it has come to be celebrated by many non-Christians.

Christmas tree Evergreen tree, usually decorated with lights and ornaments, to celebrate the Christmas season. The use of evergreen trees, wreaths, and garlands as symbols of eternal life was common among the ancient Egyptians, Chinese, and Hebrews. The Christian symbol can be traced to a German medieval play about Adam and Eve, which included the "paradise tree," hung with apples. The modem, decorated version was widespread among German Lutherans by the 18th century. Brought to North America by German settlers in the 17th century, it had become widespread there by the mid- 19th century. It was popularized in 19th-century England by Victoria's consort, the German Prince Albert of Saxe-Coburg.

Christo orig. Christo Javacheff (b. June 13, 1935, Gabrovo, Bulg.) Bulgarian-born U.S. environmental artist. After attending Sofia's Fine Arts Academy, he moved to Paris in 1958, where he invented empaquetage, the wrapping of objects in various materials as art. He began with cans and bottles, and eventually his projects expanded to buildings and landscapes. In 1964 he moved to New York City. He is noted for such monumental outdoor projects as Valley Curtain (1970-72) in Rifle Gap, Colo., and Running Fence (1972–76) in Marin and Sonoma counties, Calif. In 1995 he wrapped the Berlin Reichstag in metallic silver fabric. Though his displays, which are temporary and involve hundreds of workers, are controversial among environmentalists, they have been critically well received. Since 1961 most have been collaborative efforts with his wife, Jeanne-Claude (b. 1935).

Christopher, Saint (fl. 3rd century; Western feast day July 25; Eastern feast day May 9) Patron saint of travelers and motorists. He is said to have been martyred in Lycia under the Roman emperor Decius (c. 250). Legends depict him as a giant who devoted his life to carrying travelers across a river. One day a small child asked to be transported, and in the middle of the river the child became so heavy that Christopher staggered under the burden. The child revealed that the saint had been carrying Christ and the sins of the world, thus giving rise to Christopher's name (Greek: "Christ-Bearer"). His historicity is doubtful.

Agatha Christie, 1 946.

UPI/CORBIS-BETTMANN

Christina, engraving by Cornelis Viss-
cher, 1 650.

COURTESY OF THE SVENSKA PORTRATTARKIVET,
STOCKHOLM

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Christus \'kris-ttBs\, Petrus (b. c. 1420, Baerle, Brabant — d. 1472/73, Bruges) Flemish painter. He is documented as working in Bruges (1444), where he was influenced by the work of Jan van Eyck. Christus is known for his sensitive portraits, but his most important contributions were the introduction of geometric perspective to Netherlandish painting, and his genrelike treatment of religious subjects, seen in works such as St. Eligius as a Goldsmith (1449) and Virgin and Child in a Domestic Interior (c. 1450-60).

chromaticism Ma-o-'ma-to-.si-zsmN In music, the use of all 12 tones, especially for heightened expressivity. A standard key or mode principally employs 7 tones, leaving 5 tones for discretionary use. Use of all 12 tones in a given piece increased in the 18th and 19th centuries. Strictly controlled chromaticism, as in the ornamentation of Frederic Chopin, did not threaten the perception of tonality. However, from the mid- 19th century on, complaints were heard with ever greater frequency that it was difficult to perceive what a given piece’s tonal centre was, the chromaticism in the works of Richard Wagner being the most notorious. The virtual breakdown in tonality in the works of advanced composers led to the free atonality of Arnold Schoenberg and his followers in the early 20th century.

chromatography V.kro-mo-'ta-gro-feN Method first described in 1903 by Mikhail S. Tsvet for separating mixed chemical substances. Ts vet’s neglected work, rediscovered in the 1930s, uses the different affinities of substances in a solution in a mobile phase (a moving stream of gas or liquid) for adsorption onto a stationary phase (a fine-grained solid, a sheet of filtering material, or a thin film of a liquid on a solid surface). Choices of materials for these phases allow enormous versatility for separating substances including biological fluids (e.g., amino acids, steroids, carbohydrates, pigments), chemical mixtures, and forensic samples. In the original technique, an organic solvent flowed through a column of powdered alumina (see aluminum), sodium carbonate, or even powdered sugar to separate mixed plant pigments. Among current adaptations are paper chromatography (PC), THIN-LAYER chromatography (TLC), liquid chromatography (LC, including high-performance liquid chromatography, or HPLC), and gas chromatography (GC). Some remain laboratory techniques, but oth-

ers (especially HPLC) can be used on an industrial scale. They require different methods for detecting and identifying the separated components, including colorimetry, spectrophotometry, mass spectrometry, and measurement of fluorescence, ionization potential, or thermal conductivity. A.J.P. Martin shared a 1952 Nobel Prize for developing LC and PC, and in his Nobel lecture announced the development (with his cowinner R.L.M. Synge and other colleagues) of GC.

chromite Relatively hard, metallic, black oxide mineral of chromium and iron ($FeCr_2O_4$) that is the chief commercial source of chromium. Chromite is commonly found as brittle masses in peridotites, serpentines, and other basic igneous and metamorphic rocks. The principal producing areas are South Africa, Russia, Albania, the Philippines, Zimbabwe, Turkey, Brazil, India, and Finland.

chromium Metallic chemical element, one of the transition elements, chemical symbol Cr, atomic number 24. A hard, steel-gray metal that takes a high polish, it is used in alloys (e.g., ferrochromium, steel, stainless steel) to increase strength and corrosion resistance. It usually has valence 2, 3, or 6 and always occurs combined with other elements, especially oxygen; chromite is its only commercial source. Various coloured gemstones (e.g., ruby, emerald, serpentine) owe their colour to chromium. Sodium chromate and dichromate are used in leather tanning, in metal surface treatment, and as catalysts. Chromium trioxide is used in chrome plating and as a colorant for ceramics. Chromium oxide, lead chromate, and various other chromium compounds are used as pigments. Chromium dioxide, strongly magnetic, is used in recording tapes and as a catalyst.

chromodynamics See quantum chromodynamics

chromosomal disorder Syndrome caused by chromosome abnormality. Normally, humans have 23 pairs of chromosomes, including one pair of sex chromosomes. Any variation from this pattern causes abnormalities. A chromosome may be duplicated (trisomy) or absent (monosomy); one or more extra full sets of chromosomes can be present (see ploidy); or part of a chromosome may be missing (deletion) or transferred to another (translocation). Resulting disorders include Down's syndrome, mental retardation, heart malformation, abnormal sexual development, malignancies, and sex-chromosome disorders (e.g., Turner's syndrome, Klinefelter's syndrome). Chromosomal disorders occur in 0.5% of births; many can now be diagnosed before birth by amniocentesis.

chromosome Microscopic, threadlike part of a cell that carries hereditary information in the form of genes. The structure and location of chromosomes differentiate prokaryotic cells from eukaryotic cells (see prokaryote, eukaryote). Every species has a characteristic number of chromosomes; humans have 23 pairs (22 pairs of autosomal, or nonsex, chromosomes and one pair of sex chromosomes). Human chromosomes consist primarily of DNA. During cell division (see meiosis, mitosis), chromosomes are distributed evenly among daughter cells. In sexually reproducing organisms, the number of chromosomes in somatic (nonsex) cells is diploid, while gametes or sex cells (egg and sperm) produced by meiosis are haploid (see ploidy). Fertilization restores the diploid set of chromosomes in the zygote.

duplicated

centromere

histones

DNA

nucleosome

dividing chromosome

chromatid

chromatin

During the first stages of cell division, the recognizable double-stranded chromosome is formed by two tightly coiled DNA strands (chromatids) joined at a point called the centromere. During the middle stage of cell division, the centromere duplicates, and the chromatid pair separates. Following cell division, the separated chromatids uncoil; the loosely coiled DNA, wrapped around its associated proteins (histones) to form beaded structures called nucleosomes, is termed chromatin.

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chromosphere Layer of the Sun’s atmosphere, several thousand miles thick, above the photosphere and below the corona. The chromosphere (literally “colour sphere”) is briefly visible as a thin ring, red from hydrogen’ s emission spectrum, during solar eclipses when the photosphere is obscured by the Moon. At other times it can be observed only with special instruments. Its temperatures range from about 7,000 °F (4,000 °C) about 700 mi (1,100 km) above the photosphere, increasing with altitude to several hundred thousand degrees. Solar flares and solar prominences are mainly chromospheric phenomena.

chronic fatigue syndrome (CFS) Sudden debilitating fatigue of unknown cause. It may follow a nonspecific illness with mild fever, tender lymph nodes, sore throat, headaches, weakness, muscle and joint pain, and confusion or difficulty in concentrating. To meet the criteria of CFS, the syndrome must be new, with a definite point of onset, and must persist more than six months. Once dismissed as imaginary, CFS remains controversial. Many authorities question whether it is a distinct disorder, since there is considerable overlap with other conditions such as fibromyalgia and Gulf War syndrome. No diagnostic test for CFS exists. Although a number of theories about the cause of CFS have been advanced, none has been proved. No cure has been found, but most patients improve gradually.

chronicle play or history play Play with a theme from history that often holds up the past as a lesson for the present. Chronicle plays devel-

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oped from medieval morality plays and flourished in times of nationalistic fervour, as in England from the 1580s to the 1630s. They included plays such as The Victories of Henry the Fifth and The True Tragedie of Richard III and reached maturity with Christopher Marlowe’s Edward II and William Shakespeare’s Henry VI.

chronometer \kra-'na-ma-tar\ Mechanical timekeeping device of great accuracy, particularly one used for determining longitude (see latitude and longitude) at sea. Early weight- and pendulum-driven clocks were inaccurate because of friction and temperature changes and could not be used at sea because of the ship’s motion. In 1735 John Harrison invented and constructed the first of four practical marine timekeepers. The modern marine chronometer is suspended to remain horizontal whatever the inclination of the ship and differs in parts of its mechanism from the ordinary watch. A chronometer may provide timekeeping accurate to within 0. 1 second per day. See also Ferdinand Berthoud.

Chrysander \kriE- , zan-d3r\ / (Karl Franz) Friedrich (b. July 8, 1826, Ltibtheen, Mecklenburg — d. Sept. 3, 1901, Hamburg) German musicologist. Trained as a schoolteacher, he soon became involved in music scholarship and published studies of folk song (1853). One of the founders of the discipline of musicology (with Philipp Spitta and Guido Adler), he wrote on a wide range of subjects, but his great project was the first edition of the complete works of George Frideric Handel, to which he devoted the years 1858-94.

chrysanthemum Ucri-'san-tho-.monA Any of the ornamental plants that make up the genus Chrysanthemum, in the composite family. The genus includes about 100 species native primarily to subtropical and temperate areas of the Old World. Cultivated species, often called mums, have large flower heads; those of wild species are much smaller. Most species have aromatic, alternate leaves. Some have both disk and ray flowers in the heads; others lack ray flowers. Costmary (C. balsamita), pyrethrum, marguerite, Shasta daisy (hybrid forms of C. maximum), florists’ chrysanthemum (C. morifolium), feverfew (C. parthenium), com marigold (C. segetum), and TANSY are popular garden plants. Feverfew and pyrethrum are used in insecticides; feverfew and tansy were formerly used in medicines.

Chrysler Building Office building (1928-30) in New York City designed by William Van Alen (1883-1954). The epitome of sleek Art Deco design, its tapering sunburst-patterned stainless-steel spire remains a striking feature of the Manhattan skyline. Much of its futuristic automotive ornamentation was specified by its owner, Walter P. Chrysler (see Chrysler Corp.). It was briefly the tallest in the world (1,048 ft [319.4 m]) until the Empire State Building opened in 1931.

Chrysler Corp. Former U.S. automotive company first incorporated in 1925; now part of Daimler-Benz. It was founded by Walter P. Chrysler (1875-1940), who built it into the country’s second largest automobile manufacturer, noted for its Plymouth, Dodge, and Chrysler cars. In 1980 the corporation was rescued from the verge of bankruptcy by a government bailout organized by Lee Iacocca. In 1998 Chrysler Corp. merged with the German automaker Daimler-Benz to become Daimler Chrysler AG.

Chrysostom Vkris-os-tonA,

Saint John (b. 347, Antioch,

Syria — d. Sept. 14, 407, Comana,

Helenopontus; Western feast day September 13; Eastern feast day November 13) Early Church Father, biblical interpreter, and archbishop of Constantinople. He was raised as a Christian and lived as a hermit until his health gave way, after which he returned to Antioch and was ordained a priest. He earned a reputation as a great preacher (Chrysostom means “golden-mouthed”).

Against his wishes, he was appointed archbishop of Constantinople in 398.

He angered the wealthy with his concern for the poor and his criticisms of the misuse of riches. A synod convened in 403 by Theophilus of Alexandria condemned him on 29 charges and banished him to Armenia. He

died en route to a more distant exile on the Black Sea. In 438 his relics were brought to Constantinople, and he was rehabilitated by the church.

chrysotile Vkri-so-.tllN Fibrous variety of the magnesium silicate mineral serpentine; it is the most important asbestos mineral. Individual fibres are white and silky, but the aggregate in veins is usually green or yellowish. Chrysotile fibres have a high tensile strength, similar to that of other asbestos minerals (see amphibole asbestos). The largest deposits of chrysotile are in Quebec and in the Ural Mountains.

Chu or Ch'u One of the states contending for power in China, 770-221 bc. Chu emerged in the 8th century bc in the Yangtze River (Chang Jiang) valley, then not a part of China. It struggled with other states for supreme control over China in the 3rd century bc but lost out to Qin, which formed the first great Chinese empire.

Chu Hsi See Zhu Xi

Chu-ko Liang See Zhuge Liang

Chu Teh See Zhu De

Ch'u Yuan See Qu Yuan

Chu Yuan-chang See Hongwu emperor

Chuan Leekpai (b. July 28, 1938, Muang district, Trang province, Thai.) Prime minister of Thailand (1992-95, 1997-2001). Son of a school-teacher, he became a lawyer and was first elected a member of Parliament in 1969. He served in various capacities in the government and was first made prime minister in 1992 after his predecessor resigned in the wake of street violence brought on by Thailand’s worsening economic crisis. He lost elections in 1995 largely because his government was seen as plodding and slow, but he was returned to power in 1997; he stepped down in 2001 after his party had lost in national parliamentary elections. He was Thailand’s first prime minister to come to power without either aristocratic or military backing.

Chuang-tzu See Zhuangzi

chub Any of several freshwater fishes of the carp family that are commonly caught for bait, sport, and food. Popular species include the European chub (Leuciscus cephalus) of Europe and Great Britain, a voracious predator of insects and other fish, and, in North America, the creek chub, or horned dace (Semotilus atromaculatus), and the homyhead chub (Nocomis , or Hybopsis, bi guttata). These species range in length from 6 to 24 in. (15-60 cm).

Their colours vary, tending toward bluish or greenish above with a lighter or silvery belly. The name is applied to many cyprinids in North America and to other, unrelated fishes elsewhere.

Chubut \chu-'biit\ River River, southern Argentina. Rising in the Andes Mountains, it flows eastward across Chubut province 500 mi (800 km) before emptying into the Atlantic Ocean at Punta Castro. It is unnavigable, but its lower course irrigates the adjacent valley, which is agriculturally important.

Chughtai, Abdur Rahman (b. Sept. 21, 1894, Lahore, Pak. — d. Jan. 17, 1975, Lahore) Pakistani artist. In the 1920s he created large watercolours in a modified Bengal-school style. By the 1940s his painting style was influenced by Mughal architecture, Islamic calligraphy, miniature painting, and Art Nouveau, and his diverse subject matter included heroes and heroines from Islamic history, Mughal kings and queens, and episodes from Punjabi, Persian, and Indo-Islamic legends and folktales. After the partition of the subcontinent in 1947, he came to be known as the national artist of Pakistan.

Chuikov \ , chu-i-,kof\ / Vasily (Ivanovich) (b. Feb. 12, 1900, Serebryannye Prudy, near Moscow, Russian Empire — d. March 18, 1982, Moscow, Russia, U.S.S.R.) Soviet general. He joined the Red Army at

age 18. In World War II he commanded the defense at the Battle of Stalingrad, joined in turning Adolf Hitler’s armies back, and led the Soviet drive to Berlin. He personally accepted the German surrender of Berlin

St. John Chrysostom, detail of a 1 2th-century mosaic; in the Palatine Chapel, Palermo, Sicily, Italy.

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in 1945. After the war he commanded the Soviet occupation forces in Germany (1949-53). He headed the Kiev military district (1953-60) and thereafter held a variety of military assignments in Moscow.

chukar Vcho-korN Popular small game bird (. Alectoris chukar), a species of partridge. Stocked in many countries, it is native from southeastern Europe to India and Manchuria. It has a brown back with strongly barred sides and a black-outlined whitish throat.

Chukchi See Siberian peoples

Chula Vista \,chu-l3-'vis-t3\ City (pop., 2000: 173,556), southwestern California, U.S. It lies on the eastern shore of San Diego Bay south of San Diego. Laid out in 1888 by the Santa Fe Railway and named for its “pretty view,” it developed as a citrus centre, later turned to truck gardening, and is now primarily residential.

Chulalongkorn Vchii-'la-Torj-'koM or Phrachunlachomklao

V.pra-chun-.la-.kom-'klauN or Rama V (b. Sept. 30, 1853, Bangkok, Siam [Thailand]— d. Oct. 23, 1910, Bangkok) King of Siam (r. 1 868—1910). He succeeded to the throne at 15 but did not assume his duties until he was 20. He enacted ambitious reforms patterned on Western models, abolishing slavery, instituting the rule of impersonal law, and overhauling his antiquated administration. By persuading Western colonial powers that Siam was a modem state and playing their interests against

one another, he kept Siam from being colonized for decades. However, in 1907 Siam was forced to give up its rights in Laos and western Cambodia to the French, and in 1909 it ceded four Malay states to Britain.

chum salmon or dog salmon

Lightly speckled North Pacific fish (Oncorhynchus keta) of the salmon family. The chum salmon ranges from the Mackenzie and Lena rivers in the southern Arctic southward to Japan and the Rogue River. Its weight averages about 10-12 lbs (4. 5-5. 5 kg). During the autumn spawning season it swims more than 2,000 mi (3,200 km) up the Yukon River.

Ch'ung-ch'ing See Chongqing
Chung Yung See Zhong yong
Chungking See Chongqing

Chunqiu or Ch'un-ch'iu Vchun-'chyiiX (Chinese: “Spring and Autumn Annals”) First Chinese chronological history, the traditional history of Lu, as revised by Confucius. One of the Five Classics of Confucianism, it recounts events during the reign of 12 rulers of Lu from 722 bc to just before Confucius’s death in 479 bc. The Confucian Dong Zhongshu claimed that the natural phenomena recorded (e.g., drought, eclipse) were intended to warn future rulers of what happens when leaders prove unworthy. Since Confucian scholars were official interpreters of the classics, the book was a means for imposing Confucian ideals. The commentary called Zuo zhuan is significant.

church Building for Christian worship. The earliest Western churches were based on the plan of the Roman basilica. In Constantinople, Anatolia, and Eastern Europe, the Orthodox church adopted the symmetrical Greek-cross plan, which had four wings of equal size projecting from a central, square, domed area (see Byzantine architecture). The late 11th century saw increased complexity in cathedrals, but the innovative hall church did not establish itself until the 14th century. The basilica and hall church dominated Western church design until the mid-20th century. Modernization of rituals and an innovative spirit have resulted in architectural experimentation that sometimes departs completely from traditional forms.

church In Christian doctrine, the religious community as a whole, or an organized body of believers adhering to one sect’s teachings. The word church translates the Greek ekklesia, used in the New Testament for the body of faithful and the local congregation. Christians established congregations modeled on the synagogue and a system of governance centred on the bishop. The Nicene Creed characterized the church as one (unified), holy (created by the Holy Spirit), catholic (universal), and apostolic (historically continuous with the Apostles). The schism of Eastern and Western churches (1054) and the Reformation (16th century) ended institutional unity and universality. St. Augustine stated that the real church is known only to God, and Martin Luther held that the true church had members in many Christian bodies and was independent of any organization.

Church, Alonzo (b. June 14, 1903, Washington, D.C., U.S. — d. Aug.

11, 1995, Hudson, Ohio) U.S. mathematician. He earned a Ph.D. from Princeton University. His contributions to number theory and the theories of algorithms and computability laid the foundations of computer science. The rule known as Church's theorem or Church's thesis (proposed independently by Alan M. Turing) states that only recursive functions can be calculated mechanically and implies that arithmetic procedures cannot be used to decide the consistency of statements formulated in accordance with the laws of arithmetic. He wrote the standard textbook Introduction to Mathematical Logic (1956) and helped found the Journal of Symbolic Logic, which he edited until 1979.

Church, Frederic Edwin (b. May 4, 1826, Hartford, Conn., U.S. — d. April 7, 1900, near New York, N.Y.) U.S. landscape painter. He studied with Thomas Cole in Catskill, N.Y., and soon became one of the most prominent members of the Hudson River school. He traveled widely, seeking out spectacular scenery and marvels of nature such as Niagara Falls, volcanoes, icebergs, and the tropical forests of South America, and he achieved fame and success at home and in Europe. His house, Olana, on the Hudson River, is now a museum.

church and state Relationship between religious and secular authority in society. In most ancient civilizations the separation of religious and political orders was not clearly defined. With the advent of Christianity, the idea of two separate orders emerged, based on Jesus's command to "Render unto Caesar what are Caesar's, and to God the things that are God's" (Mark 12:17). The close association of religion and politics, however, continued even after the triumph of Christianity as emperors such as Constantine exercised authority over both church and state. In the early Middle Ages secular rulers claimed to rule by the grace of God, and later in the Middle Ages popes and emperors competed for universal dominion. During the Investiture Controversy the church clearly defined separate and distinct religious and secular orders, even though it laid the foundation for the so-called papal monarchy. The Reformation greatly undermined papal authority, and the pendulum swung toward the state, with many monarchs claiming to rule church and state by divine right. The concept of secular government, as evinced in the U.S. and postrevolutionary France, was influenced by Enlightenment thinkers. In western Europe today all states protect freedom of worship and maintain a distinction between civil and religious authority. The legal systems of some modern Islamic countries are based on Sharjah. In the U.S. the separation of church and state has been tested in the arena of public education by controversies over issues such as school prayer, public funding of parochial schools, and the teaching of creationism.

church mode In music, any one of eight scalar modes employed for medieval liturgical melodies. The modal system was conceived for the purpose of codifying plainchant (see Gregorian chant); the names of the modes were borrowed from the system used by the ancient Greeks, though the Greek system was inadequately understood and the connection between the two is illusory. The modes are distinguished according to the note used as the final (last note) and the emphasis placed on another note, called the dominant. The Dorian mode's final is D, the Phrygian mode's is E, the Lydian mode's is F, and the Mixolydian's is G. Each of these four original modes had a parallel mode (Hypodorian, Hypophrygian, Hypolydian, and Hypomixolydian) with a lower range. Though they principally employ the tones A-B-C-D-E-F-G, some replace B with B-flat. In the 16th century, further modes were identified — the Aeolian, on A, and the Ionian, on C (corresponding to modern minor and major). The mode on B was

ignored because of B’s problematic tonal relationship within the scale.

Church of Christ See Church of Christ
Church of England See Church of England

Churchill, Randolph (Henry Spencer), Lord (b. Feb. 13, 1849, Blenheim Palace, near Woodstock, Oxfordshire, Eng. — d. Jan. 24, 1895, London) British politician. Third son of the 7th duke of Marlborough, he

Chulalongkorn

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entered the House of Commons in 1874. In the early 1880s he joined other Conservatives in forming the Fourth Party, which advocated a “Tory democracy” of progressive conservatism. In 1886, at age 37, he became leader of the House of Commons and chancellor of the Exchequer, but he resigned after his first budget was rejected. Though he had seemed destined to be prime minister, this miscalculation effectively ended his political career. He remained in the Commons until his death, but he lost interest in politics and devoted much time to horse racing. Winston Churchill was his son.

Churchill, Sir Winston (Leonard Spencer) (b. Nov. 30, 1874, Blenheim Palace, Oxfordshire, Eng. — d. Jan. 24, 1965, London) British statesman and author. Son of Lord Randolph Churchill and the American Jennie Jerome, he had an unhappy childhood and was an unpromising student. After joining the 4th Hussars in 1895, he saw service as both a soldier and a journalist, and his dispatches from India and South Africa attracted wide attention. Fame as a military hero helped him win election to the House of Commons in 1900. He quickly rose to prominence and served in several cabinet posts, including first lord of the Admiralty (1911-15), though in World War I and during the following decade he acquired a reputation for erratic judgment. In the years before World War II, his warnings of the threat posed by Adolf Hitler’s Germany were repeatedly ignored. When war broke out, he was appointed to his old post as head of the Admiralty. After Neville Chamberlain resigned, Churchill headed a coalition government as prime minister (1940^15). He committed himself and the nation to an all-out war until victory was achieved, and his great eloquence, energy, and indomitable fortitude made him an inspiration to his countrymen, especially in the Battle of Britain. With Franklin Roosevelt and Joseph Stalin, he shaped Allied strategy through the Atlantic Charter and at the Cairo, Casablanca, and Tehran conferences. Though he was the architect of victory, his government was defeated in the 1945 elections. After the war he alerted the West to the expansionist threat of the Soviet Union. He led the Conservative Party back into power in 1951 and remained prime minister until 1955, when ill health forced

his resignation. For his many writings, including The Second World War (6 vol., 1948-53) he was awarded the Nobel Prize for Literature in 1953; his later works include his History of the English-Speaking Peoples (4 vol., 1956-58). He was knighted in 1953; he later refused the offer of a peerage. He was made an honorary U.S. citizen in 1963. In his late years he attained heroic status as one of the titans of the 20th century.

Churchill Fall s formerly Grand Falls Part of a series of cataracts and rapids on the Churchill River, Newfoundland, Canada. The falls drop 245 ft (75 m) and are 200 ft (60 m) wide. They power one of Canada’s largest hydroelectric stations. Visited in 1839 by John McLean of the Hudson's Bay Company, the cataracts were called Grand Falls until 1965, when both falls and river were renamed for Winston Churchill, who died that year.

Churchill River River, central Canada. Rising in north-central Saskatchewan, it flows east across Saskatchewan and northern Manitoba and turns northeast into Hudson Bay at Churchill. About 1,000 mi (1,609 km) long, it passes through several lakes, including Churchill Lake (213 sq mi [552 sq km]) in Saskatchewan and Granville Lake in Manitoba.

churinga See tjurunga

Churrigueresque \,chur-i-g9-'resk\ Spanish Rococo architectural style named after the architect Jose Churriguera (1665-1725). Visually frenetic, it featured a plethora of extravagant ornament and surfaces bristling with broken pediments, undulating cornices, spirals, balustrades, stucco shells, and garlands. In Spanish America, tendencies from both Native American and Mudejar (Spanish-Moorish) art were incorporated, and the Churrigueresque column, an inverted cone, became the most common motif.

ChQzenji \chii-'zen-je\. Lake Lake, east-central Honshu, Japan. Situated at an elevation of 4,163 ft (1,269 m), it is a resort site noted for its shrines, yachting, trout fishing, and skiing. Volcanic Mount Nantai towers to 8,169 ft (2,490 m) above the lake’s northern shore; lower mountains surround most of the irregular 13 -mi (21 -km) shoreline.

chyme Vklm\ Thick semifluid mass of partly digested food and secretions, formed in the stomach and intestines during digestion. Its composition changes as various digestive juices and cellular debris and other waste products are added, and water and nutrients are absorbed from it during its passage through the digestive tract, at the end of which it is stored for excretion.

CIA See Central Intelligence Agency

Ciano Vcha-no\, Galeazzo, count di Cortellazzo (b. March 18, 1903, Livorno, Italy — d. Jan. 11, 1944, Verona) Italian politician. He took part in the fascists’ March on Rome and later entered the diplomatic corps. After marrying Benito Mussolini’s daughter Edda in 1930, he became minister of foreign affairs (1936) and initiated the Rome-Berlin Axis that helped bring Italy into World War II. After several Axis defeats in 1942, he advocated a separate peace with the Allies. Mussolini dismissed his cabinet (1943), but Ciano and other leading fascists forced Mussolini’s resignation. Later, on Mussolini’s orders, Ciano was tried for treason and executed.

Ciaran of Clonmacnoise \'kir-9n... 1 klan-mok- , n6iz\, Saint or Kieran the Younger (b. c. 516, Ireland — d. c. 549, Clonmacnoise; feast day September 9) Irish abbot, one of the founders of monasticism in Ireland. Ciaran was educated with St. Columba at the monastery of Clonard and then lived on the island of Aranmore as a disciple of St. Enda. He traveled to central Ireland and settled with eight companions at Clonmacnoise, where he founded an abbey (548) that later won renown as a center of medieval learning. Ciaran' s abbey was so influential that more than half the monasteries in Ireland followed its severely ascetic rule. There is an annual pilgrimage to Clonmacnoise on his feast day.

Ciba-Geigy AG \,se-b3-'gl-ge\ Former Swiss pharmaceutical company formed in 1970 from the merger of Ciba AG and J.R. Geigy SA. Ciba started out in the 1850s as a silk-dyeing business and branched out into pharmaceuticals in 1900, by which time it was the largest chemical company in Switzerland. J.R. Geigy dates to 1758, when Johann Rudolf Geigy set up a chemist's shop in Basel. The company soon began manufacturing dyes for the textile industry. It entered the pharmaceutical market in the 1930s. The name was shortened to Ciba in 1992, and in 1996 Ciba's merger with the Swiss company Sandoz formed Novartis AG, one of the world's largest pharmaceutical companies.

Cibber Vsib-9r\, Colley (b. Nov. 6, 1671, London, Eng. — d. Dec. 11, 1757, London) British actor-manager, playwright, and poet. He began his career as an actor in 1690. His Love's Last Shift (1696) is considered the first sentimental comedy. Cibber and two other actor-managers comanaged the Drury Lane Theatre (1710-33). He was appointed poet aureate in 1730. His autobiography, An Apology for the Life of Mr. Colley Cibber (1740), contains the best account of the theatre of his day. Tactless, rude, and supremely self-confident, he was the target of many personal and political attacks; Alexander Pope mocked him as king of the dunces in his satirical poem The Dunciad. See also actor-manager system.

Cibola \'se-b6-la\, Seven Cities of Legendary cities of splendour and riches sought by Spanish coNQUiSTADORes in North America during the 16th century. The cities were first reported by Alvar Nunez Cabeza de Vaca, who was shipwrecked off Florida in 1528 and who wandered through what later became Texas and northern Mexico before his rescue in 1536. Expeditions sent to search for the cities were unsuccessful; one led by Francisco Vazquez de Coronado in 1540 located a group of Zuni pueblos but failed to find vast treasures.

Ciboney \si-'bo-na\ Extinct group of Indian people who inhabited the Greater Antilles in the Caribbean Sea. By the time the Spanish arrived in the 16th century, they had been driven by their more powerful Taino neighbours to a few isolated locations in what are now Cuba and Haiti. They lived in settlements of one or two families and apparently subsisted largely on seafood. The tool technology of the Cuban Ciboney was based on shell, that of the Haitian Ciboney on stone. Within a century of the first European contact, the Ciboney were extinct.

cicada Vso-'ka-doX Any insect in the order Homoptera that has two pairs of membranous wings, prominent compound eyes, and three simple eyes (ocelli). Most of the 1,500

Newly emerged adult cicada (Tibicen pruinosa).

RICHARD PARKER

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known species are in the family Cicadidae and are found in tropical deserts, grasslands, and forests. Males produce loud noises by vibrating membranes near the base of the abdomen. Most North American cicadas produce rhythmical ticks, buzzes, or whines, though the “song” of some species is musical. The species are easily distinguishable by song, behaviour, and appearance. Periodic cicadas (species that occur in large numbers in chronologically and geographically isolated broods) appear in regular cycles, including the well-known 17-year cicada (often erroneously called the 17-year locust) and 13 -year cicada. The larvae (nymphs) burrow into the ground, where they remain for 17 or 13 years, feeding on juices sucked from roots; they then emerge in large numbers to live aboveground as adults for a single week.

Cicero Vsi-sa-.roV, Marcus Tullius (b. 106 bc, Arpinum, Latium — d. Dec. 7, 43 bc, Formiae) Roman statesman, lawyer, scholar, and writer. Born to a wealthy family, he quickly established a brilliant career in law and plunged into politics, then rife with factionalism and conspiracy. Cicero was elected consul in 63 bc. Of his speeches, perhaps the best known are those he made against Catiline, whose uprising he foiled. He vainly tried to uphold republican principles in the civil wars that destroyed the Roman Republic. After the death of Julius Caesar, he delivered his 14 Philippic orations against Mark Antony. When the triumvirate of Antony, Octavian (later Augustus), and Marcus Lepidus was formed, he was executed. His extant works include 58 orations and more than 900 letters, as well as many poems, philosophical and political treatises, and books of rhetoric. He is remembered as the greatest Roman orator and the innovator of what became known as Ciceronian rhetoric, which remained the foremost rhetorical model for many centuries.

cichlid \'si-kl3d\ Any of more than 600 primarily freshwater fish species (family Cichlidae), including many popular aquarium species. Cichlids are found in the New World tropics, Africa and Madagascar, and southern Asia. Most species are African, appearing in great diversity in the major African lakes. Cichlids are deep-bodied and have a rounded tail. They usu-

ally grow no longer than about 12 in. (30 cm). Species may be omnivores, herbivores, or carnivores. Cichlids are noted for their complex mating and breeding behavior. Certain species (e.g., tilapia), known as mouthbreeders, carry their eggs in the mouth until hatched. See also angelfish.

Cid \'sid\, the Spanish El Cid orig. Rodrigo Diaz de Vivar (b. c.

1043, Vivar, near Burgos, Castile — d. July 10, 1099, Valencia) Castilian military leader and national hero. His popular name, El Cid (from Spanish Arabic al-sid, “lord”), dates from his lifetime. Brought up at the court of Ferdinand I, the Cid served the king’s eldest son, Sancho II, in his campaign to gain control of Leon. On Sancho’ s death he shifted to the service of Alfonso VI, whom he had formerly opposed. His unauthorized raid on the Moorish kingdom of Toledo (1081) prompted Alfonso to send him into exile. He then entered the service of the Muslim rulers of Zaragoza, becoming known as a general who was never defeated in battle. Alfonso tried unsuccessfully to win him back during the Almoravid invasion of Spain. The Cid maneuvered to gain control of the Moorish kingdom of Valencia, finally succeeding in 1094. He was speedily elevated to the status of national hero, and his exploits were celebrated in a heroic biography and a famous 12th-century epic poem.

cider Expressed juice of apples. Apples are ground to a fine pulp and then pressed. Hard (alcoholic) cider is fermented in vats for up to three months before being filtered and aged (see fermentation). Sweet cider is unfermented and either drunk fresh (as in the U.S.) or mellowed in pressurized tanks first (particularly in Europe). Most cider in the U.S. is now pasteurized. Juice that is pasteurized, treated with a preservative, and often clarified before being hermetically sealed in cans or bottles is marketed as apple juice.

cientifico \se-en-'te-fi-ko\ Spanish "scientist" Member of a group of officials who served in the government of Porfirio Diaz (1877-80, 1 884—1911) in Mexico. Influenced by positivism and rejecting metaphysics, theology, and idealism as inadequate to solve Mexico’s problems, they advocated applying what they considered to be the scientific methods of the social sciences to the problems of finance, education, and industrialization. They had little influence on Diaz, but the movement took root in other parts of Latin America in the late 19th and early 20th centuries.

cigar Cylindrical roll of tobacco for smoking, consisting of cut tobacco filler formed in a binder leaf and with a wrapper leaf rolled spirally around the bunch. Wrapper leaf, the most expensive leaf used in cigars, must be strong, elastic, silky in texture, and even in colour; it must have a pleas-

ant flavour and good burning properties. Cigars are bigger than cigarettes, and the odour and smoke they produce are stronger. Cigars were being smoked by Maya Indians by the 10th century; they were reported back to Spain by Christopher Columbus and other explorers and became popular there long before they spread to other European countries.

cigarette Paper-wrapped roll of finely cut tobacco for smoking. Cigarette tobacco is usually milder than cigar tobacco. The Aztecs and other New World peoples smoked tobacco in hollow reeds, in canes, or wrapped in leaves, but it was in pipes and as cigars (cut tobacco wrapped in a tobacco leaf) that the Europeans first smoked tobacco. Early in the 16th century beggars in Sevilla, Spain, began picking up discarded cigar butts

and wrapping them in scraps of paper to smoke, creating the first European cigarettes. In the late 18th century cigarettes acquired respectability, and in the 19th century their use spread throughout Europe. After World War I smoking cigarettes became generally respectable for women and consequently increased markedly. In the 1950s and ’60s the health hazards associated with smoking (including lung cancer and heart disease) became widely known, and some countries launched campaigns against smoking. Declines in smoking in those countries have been offset by vastly increased numbers of smokers in developing nations.

cilantro See coriander

Cilicia \s3-'li-sho\ Ancient district, southern Anatolia. The district was located along the coast of the Mediterranean Sea south of the Taurus Mountains. In ancient times it comprised the only land route from Anatolia to Syria, making it a prized territory. Controlled by the Hittites (14th– 13th century bc), the Assyrians (8th century), and the Persian Achaemenids (6th – 4th century), it later came under Macedonian and Seleucid rule. In the 1st century bc it became a Roman province (see Roman Republic and Empire). The apostle Paul visited the district, which has early Christian monuments. Muslim Arabs occupied it (7th- 10th century ad), at the end of which time it was reconquered by Byzantine Empire. It was absorbed by the Ottoman Empire in 1515 and after 1921 became part of the Republic of Turkey.

Cilician Gates See Taurus Mtns.

cilium Vsi-le-omV Short, eyelashlike filament that is numerous on tissue cells of most animals. Capable of beating in unison, cilia perform a variety of functions, including providing the means of locomotion for some protozoans, moving mammalian ova (eggs) through oviducts, generating water currents to carry food and oxygen past the gills of clams, and cleaning debris from mammalian respiratory systems. Like a flagellum, a cilium has a central core consisting of two central microtubules surrounded by an outer ring of nine double fibres. Ciliary outgrowth is controlled by the basal body, located just inside the cell surface at the base of the cilium. Beneath the surface of some cells is a network of microtubular bundles that may coordinate ciliary beating.

Cimabue \,che-m3-'bu-a\ orig. Benciviene di Pepo (b. before 1251 – d. 1302) Florentine painter and mosaicist. He is documented as a master painter in Rome in 1272. It is assumed that he was apprenticed to an Italo-Byzantine painter, since he was strongly influenced by the Greek Byzantine style. Though a number of works are attributed to him, the only one dated is the mosaic of St. John the Evangelist (1301-02) in Pisa Cathedral. He was the outstanding master of his generation and began the movement toward greater realism that culminated in the Renaissance. His style influenced Giotto and Duccio. Cimabue’ s character may be reflected in his name, which can best be translated as “bullheaded.”

Cimarosa V.che-ma-'ro-zaV Domenico (b. Dec. 17, 1749, Aversa, Kingdom of Naples – d. Jan. 11, 1801, Venice) Italian opera composer. Son of a stonemason, he studied at the Naples Conservatory. His first opera was produced in 1772, and by the mid- 1780s he was internationally known. A short engagement as kapellmeister at the Viennese court resulted in the famous comic opera II matrimonio segreto (1792). In 1796 he became organist in the royal chapel of Naples. He wrote some 75 operas, remarkable for their apt characterizations and abundant comic life. He wrote many

choral works, including the cantata Il maestro di cappella, a popular satire on contemporary operatic rehearsal methods. Among his instrumental works, which, like his operas, have been successfully revived, are many sparkling harpsichord sonatas and a concerto for two flutes.

Cimarron Vsi-mo-.ron, , si-m3-,ran\ River River, southwestern U.S. Rising in northeastern New Mexico, it flows 698 mi (1,123 km) to enter the Arkansas River near Tulsa, Okla. Traversing the northern Oklahoma

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Panhandle, southeastern Colorado, and southwestern Kansas, the riverbed in this area is often dry and is known as the Dry Cimarron. The Santa Fe Trail coursed along its valley for 100 mi (160 km), and travelers knew the Oklahoma Panhandle as the “Cimarron Cutoff.”

Cimmerian \s3-'mir-e-9n\ Any member of an ancient people living north of the Caucasus and the Sea of Azov. Their origins are obscure; linguistically they are usually regarded as Thracian or Iranian. Driven by the Scythians out of southern Russia and over the Caucasus, they entered Anatolia toward the end of the 8th century bc. In 696-695 bc they conquered Phrygia. They reached the summit of their power in 652 after taking Sardis, capital of Lydia. Their decline soon began, and their final defeat may be dated from 637 or 626, when they were routed by Alyattes of Lydia.

Cimon VsI-monV (b. c. 510 — d. c. 451 bc, Cyprus) Athenian statesman and general. He was the son of Miltiades. A conservative, he promoted Sparta and opposed Pericles. After helping defeat the Persians at the Battle of Salamis (480), he was elected strategus every year until 461. As commander of the Delian League, he cleared the Persians from the eastern Mediterranean and helped to lay the groundwork for the Athenian empire. In 461 he was accused by Pericles of collaborating with Macedonia and Sparta and was exiled for 10 years. He died leading a naval expedition against Persia.

cinchona Vsiq-'ko-no, sin-'ch6-no\ Any of about 40 species, mostly trees, that make up the genus Cinchona in the madder family. Cinchona is native to the Andes Mountains. Four species have been cultivated in tropical regions for hundreds of years, mostly in Java and, since World War II, in Africa. The bark is processed to obtain various alkaloids. The most significant are quinine, used to treat malaria, and quinidine, used mainly for cardiac rhythmic disorders. High demand for quinine among Europeans living in the tropics led naturalists to smuggle cinchona seeds from South America to plantations in Asia in the mid 1800s and to conduct intensive research leading to new high-yield strains and improved processing methods.

Cincinnati City (pop., 2000: 331,285), Ohio, U.S. Situated on the Ohio River across from Kentucky, it was first settled in 1788; the area was renamed in 1790 to honour the Society of the Cincinnati. A river port after 1811, it grew in importance with the opening of the Miami and Erie Canal in 1832. Its manufactures include transportation equipment and building

materials, and it is a major inland coal port. A cultural centre, it has an orchestra, opera and ballet companies, and several notable museums. It is the seat of the University of Cincinnati (1819), the birthplace of William Howard Taft (now a national historical site), and the site of the Harriet Beecher Stowe House, where she lived briefly and frequently visited her family during her tenure in the city (1832-50).

Cincinnati, Society of the Hereditary, military, and patriotic organization formed in 1783 by officers who had served in the American Revolution. The group’s aims were to promote union, maintain war-forged friendships, and help members in need. Membership was offered to all officers and their eldest male descendants. George Washington was its first president. The group took its name from the Roman citizen-soldier Cincinnatus. The city of Cincinnati was named in its honour in 1790.

Cinco de Mayo \'seq-ko-da-'mI-o\ Spanish "Fifth of May" Mexican holiday commemorating the Mexican victory over the French at Puebla in 1862. The French army, better-equipped and far larger than the Mexican army, had been sent by Napoleon III to conquer Mexico. The Mexicans, under Gen. Ignacio Zaragoza, defeated the French at Puebla, inflicting serious losses. The French withdrew to the coast but returned the next year to take Puebla; they would control most of Mexico for the next four years. Cinco de Mayo celebrations often include music, dancing, and parades.

cinder cone or ash cone Deposit around a volcanic vent, formed by rock fragments or cinders that accumulate and gradually build a conical hill with a bowl-shaped crater at the top. Cinder cones develop from explosive eruptions of lavas and are often found along the flanks of shield (gently sloping) volcanoes. Lava flows may break out of the cone, or they may flow from under the cone through tunnels. Cinder cones are common in nearly all volcanic areas. Although they are composed of loose or only moderately consolidated cinder, many are surprisingly long-lasting, because rain falling on them sinks into the highly permeable cinders instead of running off down their slopes and eroding them.

cinema verite Vsi-no-mo-.ver-i-'taV French : "truth cinema" French film movement of the 1960s that strove for candid realism by showing people in everyday situations with authentic dialogue. Influenced by documentary filmmaking and Italian Neorealism, the method produced such outstanding examples as Jean Rouch’s Chronicle of a Summer (1961) and Chris Marker’s Joli Mai (1962). A similar movement in the U.S., where it was called “direct cinema,” captured the reality of a person or an event by using a handheld camera to record action without narration, as in Frederick Wiseman’s Titicut Follies (1967) and the Maysles brothers’ Salesman (1969).

cinematography Art and technology of motion-picture photography. It involves the composition of a scene, lighting of the set and actors, choice of cameras, camera angle, and integration of special effects to achieve the photographic images desired by the director. Cinematography focuses on relations between the individual shots and groups of shots that make up a scene to produce a film’s effect. Well-known cinematographers include Nestor Almendros, Gregg Toland, and Sven Nykvist.

cinnabar Mercury sulfide (HgS), the chief ore mineral of mercury. It is

commonly encountered with pyrite, marcasite, and stibnite in veins near recent volcanic rocks and in hot-springs deposits. It has been used as a bright orange-red pigment in stage makeup (now known to be toxic), painting, and Chinese lacquerwork.

cinnamon Bushy evergreen tree {Cinnamomum zeylanicum) of the laurel family. Native to Sri Lanka,

India, and Burma, cinnamon is also cultivated in South America and the West Indies for the spice consisting of its dried inner bark. The light-brown spice has a delicately fragrant aroma and warm, sweet flavor. It was once more valuable than gold. Today cinnamon is used to flavor various foods. In Europe and the U.S. it is especially popular in bakery goods. The oil is distilled from bark fragments for use in food, liqueur, perfume, and drugs.

Cinque Ports VsiqkV Medieval confederation of English Channel ports, southeastern England. To the original “five ports” — Hastings, New Romney, Hythe, Dover, and Sandwich — were later added Winchelsea and Rye. Probably first associated in the reign of Edward the Confessor (r. 1042-66) to defend the coast and cross-channel traffic, they were granted special privileges by the crown and in exchange provided the permanent nucleus of ships and men for the royal fleet. They declined in importance after the 14th century.

cinquefoil \'siqk-foil\ Any of the approximately 500 species of shrubs and herbaceous plants in the genus Potentilla (rose family). The common name, meaning “five-leaved,” refers to the number of leaflets in the compound leaf of most species. Most species are native to the northern temperate zone and the Arctic and are chiefly perennial. The stems are creeping or erect. The solitary, five-petaled flowers are usually yellow, sometimes white or red in horticultural varieties. P. fruticosa includes many dwarf shrubs used in landscaping (see LANDSCAPE GARDENING).

Ciompi \'cham-pe\. Revolt of the (1378) Uprising of cloth workers and other craftsmen in Florence that brought a democratic government to power. A struggle between ruling factions triggered the rebellion, which was led by the ciompi (wool carders). The rebels demanded a more equitable fiscal policy and the right to establish guilds for those groups not already organized. They took over the government briefly, but worsening economic conditions and the combined efforts of the established guilds soon led to their ouster.

circadian rhythm \s3r-'ka-de-3n\ Inherent cycle of approximately 24 hours in length that appears to control or initiate various biological pro-

cesses, including sleep, wakefulness, and digestive and hormonal activity. The natural signal for the circadian pattern is the change from darkness

Cinnabar from Red Devil Mine, north of Homer, Alaska

COURTESY OF THE MAC FALL COLLECTION; PHOTOGRAPH, MARY A. ROOT

Common cinquefoil (Potentilla simplex)

ARTHUR W. AMBLER FROM THE NATIONAL AUDUBON SOCIETY COLLECTION/PHOTO RESEARCHERS- EB INC.

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to light. The controlling mechanism for these cyclic processes within the body is thought to be the hypothalamus. Any change in the circadian cycle (such as jet lag and other conditions associated with travel) requires a certain period for readjustment.

Circassian \s9r-'ka-sh9n\ language Northwestern Caucasian language, with major eastern and western dialect groups. Until the 1860s Circassian-speaking groups inhabited the entire northwestern Caucasus region, including the Black Sea coast. After the Russian conquest of the northwestern Caucasus in 1864, most Circassian-speakers immigrated to the Ottoman Empire and were eventually settled in present-day Turkey, Syria, Jordan, and Israel. Only scattered enclaves of Western Circassian-speakers stayed in Russia. A greater number of Eastern Circassians remained; most now live in Russia’s northern Caucasus republics. Russian Circassian-speakers now number about 550,000; the number outside Russia is indeterminable, because many ethnic Circassians have switched to the dominant languages of their new countries.

Circe \'sor-se\ In Greek legend, a sorceress, the daughter of the sun god Helios and the ocean nymph Perse. By means of drugs and incantations she turned humans into lions, wolves, or swine. Odysseus visited her on his return from the Trojan War, and she changed his companions into swine. Odysseus himself was protected by an herb given him by Hermes, and he compelled the sorceress to restore his companions. He and Circe became lovers, but after a yearlong stay he resumed his journey homeward.

Circeo \chir-'cha-o\, Mt. ancient Circaeum Promontorium.

Mountain, southwestern coast of Italy. The promontory, on the Tyrrhenian

Sea, rises 1,775 ft (541 m), and is connected with the mainland by a low saddle. About 33 sq mi (86 sq km) are preserved as a national park. From the sea it resembles an island, and it has been associated with the legend of Circe since classical times. Its coastal grottoes have yielded traces of Stone Age settlement, and there are remains of a Roman acropolis.

circle Geometrical curve, one of the conic sections, consisting of the set of all points the same distance (the radius) from a given point (the centre). A line connecting any two points on a circle is called a chord, and a chord passing through the centre is called a diameter. The distance around a circle (the circumference) equals the length of a diameter multiplied by k (see pi). The area of a circle is the square of the radius multiplied by n. An arc consists of any part of a circle encompassed by an angle with its vertex at the centre (central angle). Its length is in the same proportion to the circumference as the central angle is to a full revolution.

circuit or electric circuit Path that transmits electric current. A circuit includes a battery or a generator that gives energy to the charged particles; devices that use current, such as lamps, motors, or electronic computers; and connecting wires or transmission lines. Circuits can be classified according to the type of current they carry (see alternating current, direct current) or according to whether the current remains whole (series) or divides to flow through several branches simultaneously (parallel). Two basic laws that describe the performance of electric circuits are Ohm's law and Kirchhoff's circuit rules. See also tuned circuit.

circuit, printed See printed circuit
circuitry, computer See computer circuitry

circuit riding In the U.S., the act, once undertaken by a judge, of traveling within a judicial district (or circuit) to facilitate the hearing of cases. The practice was largely abandoned with the establishment of permanent courthouses and laws requiring parties to appear before a sitting judge.

circulation Process by which nutrients, respiratory gases, and metabolic products are transported throughout the body. In humans, blood remains within a closed cardiovascular system composed of the heart, blood vessels, and blood. Arteries carry blood away from the heart under high pressure exerted by the heart’s pumping action. Arteries divide into smaller arterioles, which branch into a network of tiny capillaries with thin walls across which gases and nutrients diffuse. Capillaries rejoin into larger venules, which unite to form veins, which carry blood back to the heart. (See artery; capillary; vein.) The right and left heart chambers send blood into separate pulmonary and systemic circulations. In the first, blood is carried from the heart to the lungs, where it picks up oxygen and releases carbon dioxide; in the second, blood is carried between the heart and the rest of the body, where it carries oxygen, nutrients, metabolic products, and wastes. See illustration above.

right common

internal jugular
vein

right pulmonary

artery

right subclavian
artery

right subclavian
vein

superior
vena cava
right
veins

ventricle
right
inferior
vena

vessels
liver

renal blood
vessels

superior
mesenteric artery

ascending colon

common iliac artery
external iliac vein

brachiocephalic
(innominate) artery

left common carotid artery
left subclavian artery
aorta

left pulmonary
artery

pulmonary
veins

left atrium

ventricle

aorta

gastric
arteries

spleen

splenic
artery

stomach

inferior

mesenteric artery

descending

colon

external iliac artery

Human circulatory system. Oxygen-rich blood is shown in red, oxygen-poor blood in blue. The pulmonary circulation consists of the right ventricle and the exiting pulmonary artery and its branches, the arterioles, capillaries, and venules of the lung, and the pulmonary vein. Unlike the other arteries and veins, the pulmonary arteries carry deoxygenated blood and the pulmonary veins carry oxygenated blood. The aorta arises from the left ventricle. The brachiocephalic artery arises from the aorta and divides into the right common carotid and right subclavian arteries. The left and right common carotids extend on either side of the neck and supply much of the head and neck. The left subclavian artery (arising from the aorta) and the right subclavian artery supply the arms. In the lower abdomen, the aorta divides into the common iliac arteries, which give rise to external and internal branches supplying the legs.

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circumcision Cutting away of all or part of the foreskin (prepuce) of the penis. The practice is known in many cultures. It is performed either shortly after birth (e.g., among Muslims and Jews), within a few years of birth, or at puberty. For Jews it represents the fulfillment of the covenant between God and Abraham (Genesis 17:10-14). That Christians were not obliged to be circumcised was first recorded biblically in Acts 15. Evidence regarding the purported medical benefits of circumcision (e.g., reduced risk of cancer) is inconclusive, and the practice persists mainly for cultural reasons. See also clitoridectomy.

circumstantial evidence In law, evidence that is drawn not from direct observation of a fact at issue but from events or circumstances that surround it. If a witness arrives at a crime scene seconds after hearing a gunshot to find someone standing over a corpse and holding a smoking pistol, the evidence is circumstantial, since the person may merely be a bystander who picked up the weapon after the killer dropped it. The popular notion that one cannot be convicted on circumstantial evidence is false. Most criminal convictions are based, at least in part, on circumstantial evidence that sufficiently links criminal and crime.

circus Entertainment or spectacle featuring animal acts and human feats of daring. The modem circus was founded in England in 1768 by the bareback rider Philip Astley (1742-1814), who built stands around his performance ring and opened Astley’ s Amphitheatre. One of his riders later established the Royal Circus (1782), the first modern use of the term.

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The first U.S. circus opened in Philadelphia in 1793. Horse acts were later joined by wild-animal acts. After the invention of the flying trapeze by Jules Leotard (1859), aerial acts were featured. P.T. Barnum expanded the traditional circus by adding two rings to create the three-ring circus (1881) and augmented it with sideshow performers. Circuses traveled throughout the U.S., Europe, and Latin America, performing in a tent (the Big Top) into the 1950s. Today circuses usually perform in permanent buildings, though small troupes still travel with tents in some regions. By the late 20th century, notable circuses also had developed in Africa, India, Spain, Brazil, and Mexico. Perhaps the most innovative trend in circuses at the turn of the 21st century was the establishment of companies such as the Cirque du Soleil; these companies employed no animals, instead emphasizing acts of human skill and daring and integrating elements of contemporary music and dance into the overall performance.

Cirenaica See Cyrenaica

cirrhosis Nso-'ro-sosX Degeneration of functioning liver cells and their replacement with fibrous connective tissue, leading to scarring. The most common cause is alcohol abuse with malnutrition. Others include bile duct obstruction, viral infection, toxins, iron or copper accumulation in liver cells, and syphilis. Jaundice, edema, and great abdominal swelling are common in all. Death usually results from internal bleeding or hepatic coma due to blood chemical imbalance.

Cisalpine \sis-'al-pln\ Republic Former republic, northern Italy. Created by Napoleon in 1797 from conquered territories, it was centred in the Po River valley and included the lands around Milan and Bologna. It was incorporated into the Napoleonic kingdom of Italy in 1805.

Ciskei \'sis-,kl\ Former black enclave. South Africa. Inhabited principally by Xhosa-speaking peoples, it bordered the Indian Ocean and South Africa. In the late 18th century the Xhosa peoples living in the area came into conflict with European settlers; the ensuing wars resulted in the region’s incorporation into the Cape Colony by the end of the 19th century. Ciskei became an administratively distinct territory within South Africa in 1961. In 1972 it was declared a self-governing black state, with its capital at Bisho. In 1981 it became nominally independent. Under the new South African constitution, it was reincorporated (1994) into South Africa as part of the new Eastern Cape province.

Cistercian \sis-'t3r-shon\ or White Monk or Bernardine Member

of a Roman Catholic monastic order founded by St. Stephen Harding (1098) at Citeaux (Latin, Cistercium), Burgundy, by Benedictines dissatisfied with their abbey's laxity. Cistercians were severely ascetic, rejected feudal revenues, and engaged in manual labor. Uniform rules applied to all houses, and all abbots were to meet annually at Citeaux. St. Bernard de Clairvaux founded 68 abbeys in his lifetime. Discipline declined as the order grew, and Cistercians disappeared from northern Europe after the Reformation. The order underwent reforms in the 16th- 17th century; members of the reformed order are popularly known as Trappists after the abbey of La Trapp. Until the 1960s, they slept, ate, and worked in perpetual silence. The original order, which underwent more moderate reforms, also survives.

Citation (foaled 1945) U.S. Thoroughbred racehorse. In four seasons he won 32 of 45 races, finished second in ten, and third in two. He won the 1948 Triple Crown, and became the first horse to win $1 million. He set a world record in 1950 by running a mile in 1:33 3/5.

Citigroup U.S. holding company formed in 1998 from the merger of Citicorp (itself a holding company incorporated in 1967) and Travelers Group, Inc. The $70 billion merger included one of the largest U.S. investment banks, Salomon Smith Barney Inc., and aimed at creating a global retail financial-services business. Citicorp, whose lineage can be traced to the First Bank of the United States, was noteworthy for its pioneering installation of automated teller machines throughout its branch offices in the 1970s. Before its merger with Travelers Group, Inc., Citicorp was the largest U.S. bank and one of the largest financial companies in the world, with about 3,000 branch offices worldwide.

Citizen Genet Affair \zh9-'ne\ Incident precipitated by the French diplomat Citizen Edmond C. Genet (1763-1834), who was sent to the U.S. in 1793 by the French government to gain support for France's war with Britain and Spain. In South Carolina Genet organized privateers to prey on British commerce and expeditions to attack Spanish and British territories. Pres. George Washington considered Genet's activities a violation of U.S. neutrality and demanded his recall. Facing possible death at the hands of the new regime in France, he was allowed to remain in the U.S.

citizenship Relationship between an individual and a state in which the individual owes allegiance to the state and in turn is entitled to its protection. In general, full political rights, including the right to vote and to hold public office, are predicated on citizenship. Citizenship entails obligations, usually including allegiance, payment of taxes, and military service. The concept arose in ancient Greece, where citizenship was granted only to property owners. The Romans initially used it as a privilege to be conferred upon or withheld from conquered peoples, but it was granted to all the empire's free inhabitants in ad 212. The concept disappeared in Europe during the feudal era but was revived in the Renaissance. Citizenship may normally be gained by birth within a certain territory, descent from a parent who is a citizen, marriage to a citizen, or naturalization. See also NATIONALITY.

Citlaltepetl Vse-.tlal-'ta-.pe-FlX or Orizaba \,o-re-'sa-ba\ Volcano, south-central Mexico. Reaching 18,406 ft (5,610 m) high, its symmetrical, snowcapped cone is the highest point in Mexico and the third high-

est peak in North America. The volcano has been dormant since 1687.

citric acid Colourless, crystalline organic compound (C 6 H 8 0 7), one of the carboxylic acids. It is present in almost all plants (especially citrus fruits) and in many animal tissues and fluids. It is one of a series of compounds involved in the physiological oxidation (see oxidation-reduction) of fats, proteins, and carbohydrates to carbon dioxide and water (see tricarboxylic acid cycle). It has a characteristic sharply sour taste and is used in many foods, confections, and soft drinks. It is added to certain foods to improve their stability in metal containers. Industrially, it is used as a water conditioner, cleaning and polishing agent, and chemical intermediate.

citric-acid cycle See tricarboxylic acid cycle

citrine \si-'tren\ Transparent, coarse-grained variety of the silica mineral quartz. Citrine is a semiprecious gem that is valued for its yellow to brownish colour and its resemblance to the rarer topaz. Natural citrine is rarer than amethyst or smoky quartz, both of which are often heated to change their natural colour to that of citrine. Citrine is often marketed under various names that confuse it with topaz to inflate its price; it may be distinguished from topaz by its inferior hardness. It occurs mainly in Brazil, Uruguay, the Ural Mountains, Scotland, and North Carolina.

Citroen \si-tro-'en\ Historic French automobile manufacturer. It was founded by Andre-Gustave Citroen (1878-1935), an engineer and industrialist who initially prospered by selling munitions in World War I. He converted his arms factory to produce small, inexpensive automobiles, introducing mass-production methods to the French auto industry. The first Citroen car appeared in 1919. The 1976 acquisition of Citroen by rival French automaker Peugeot led to the creation of PSA Peugeot Citroen SA, which was a leading European manufacturer of trucks and automobiles.

citron Small evergreen tree or shrub (Citrus medico). A member of the rue family, citron is cultivated in Mediterranean countries and the West Indies. It has irregular, spreading, spiny branches and large, pale green, broadly oblong leaves. The flowers of the acidic varieties (e.g., the Diamante) are purple on the outside and white on the inside; those of sweet varieties (e.g., the Corsican) are creamy white. The oval or oblong fruit yields firm pulp, either acidic or sweet, that is used only for by-products. The thick peel is cured in brine, candied, and sold as a confection. The fruit of the Etrog variety is used in Jewish religious rites.

citrus Any of the plants that make up the genus Citrus, in the rue family, that yield pulpy fruits covered with fairly thick skins. The genus includes the lemon, lime, sweet and sour oranges, tangerine, grapefruit, citron, and shaddock (C. maxima, or C. grandis', also called pomelo).

citrus family See rue family

city Relatively permanent and highly organized centre of population, of greater size or importance than a town or village. The first cities appeared in Neolithic times when the development of agricultural techniques assured surplus crop yields large enough to sustain a permanent population. Ancient Greece saw the creation of the city-state, a form also important in the emergence of the Roman empire as well as the medieval Italian trading centers of Venice, Genoa, and Florence. After the Middle Ages, cities came increasingly under the political control of centralized govem-

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ment and served the interests of the nation-state. The Industrial Revolution further transformed city life, as factory cities blossomed rapidly in England, northwestern Europe, and the northeastern U.S. By the mid-20th century, 30-60% of a country's population might be living in its major urban centers. With the rise of the automobile came the growth of suburbs and urban sprawl, as factories, offices, and residences erected in earlier periods became aged and obsolete. Today many cities suffer from lack of adequate housing, sanitation, recreational space, and transportation facilities, and face problems of inner-city decay or burgeoning shantytowns. Local governments have sought to alleviate these problems through URBAN PLANNING.

city government Set of governmental institutions that serve an urban area or urban municipality. All cities derive their existence from a larger political entity, either a state or national government. City government generally includes an executive (a mayor or manager) and a legislature (a council or commission), both of which may be subject to popular election. Their most important functions are the provision of services, including public safety, health care, education, recreation, housing, utilities, transportation, and cultural facilities. Revenues come from local taxes and fees as well as grants and subsidies from its state or national government.

city-state Political system consisting of an independent city with sovereignty over a fixed surrounding area for which it served as leader of religious, political, economic, and cultural life. The term was coined in the 19th century to describe ancient Greek and Phoenician settlements that differed from tribal or national systems in size, exclusivity, patriotism, and ability to resist incorporation by other communities. They may have developed when earlier tribal systems broke down and splintered groups established themselves as independent nuclei c. 1000-800 bc; by the 5th century bc they numbered in the hundreds, with Athens, Sparta, and Thebes among the most important. Incapable of forming any lasting union or federation, they eventually fell victim to the Macedonians, the Carthaginians, and the Roman empire. In the 11th century the city-state revived in Italy; the success of medieval Italy's city-states, including Pisa, Florence, Venice, and Genoa, was due to growing prosperity from trade with the East, and several survived into the 19th century. Germany's medieval city-states included Hamburg, Bremen, and Lubeck. The only city-state extant today is Vatican City.

Ciudad Guayana V.syii-'thath-ga-'ya-na \ formerly Santo Tome de Guayana City (pop., 2000 est.: 704,168), Venezuela. Located at the confluence of the Carom and Orinoco rivers in the Guiana Highlands, the city site was first settled in 1576. An amalgamation of several cities, Ciudad Guayana is a planned community founded by the state assembly in 1961. It has forestry, diamond mining, and paper and pulp enterprises.

Ciudad Juarez See Juarez

Ciudad Victoria \ l syii- , thath-vek- , t6r-ya\ City (pop., 2000: 249,029), capital of Tamaulipas state, northeastern Mexico. Founded in 1750, the settlement was renamed in 1825 for Mexico's first president, Guadalupe Victoria. In addition to being a distribution point in an agricultural region, it is a tourist destination and a centre for hunting, fishing, and swimming. The University of Tamaulipas was established in 1956.

civet Vsi-v3t\ Any of 15-20 species of long-bodied, short-legged carnivores (family Viverridae) found in Africa, southern Europe, and Asia.

Catlike in appearance, civets have a thickly furred tail, small ears, and pointed snout. Civets are commonly buff or grayish, with black spots or stripes or both. They range in length from 16 to 34 in. (40-85 cm), excluding the 5-26-in. (13-66-cm) tail, and in weight from 3.3 to 24 lbs (1.5-11 kg). Civets mark territories with a greasy, musklike secretion (called civet) stored in a pouch under the tail; civet is sometimes used in the manufacture of perfumes. Usually solitary, civets feed on small animals and on vegetable matter. Five species are considered in possible danger of extinction.

civic center Grouping of municipal facilities in a limited precinct often adjacent to the central business district of a city. The civic center is based on both the Greek acropolis and the Roman forum. The plan includes the city hall and adjoining park or plaza, headquarters for city departments, courthouses, and often a post office, public-utility offices, public health facilities, and government offices.

civic theatre Theatre wholly or partly subsidized by the city in which it operates. The term is also used for a noncommercial community theatre, meaning a noncommercial, locally based group. Most civic theatres in Europe are professional organizations; in the U.S. they are often run by amateur groups and may later become resident professional theatres. The first major U.S. civic theatre was established in New Orleans in 1919.

Civil Constitution of the Clergy (July 12, 1790) Act, passed by the National Assembly during the French Revolution, that subordinated the Roman Catholic church in France to the state. Under its provisions, enfranchised citizens would elect bishops and parish priests and the state would pay the clergy's wages. The act soon provoked opposition, and when the National Assembly ordered the clergy to take an oath supporting the Civil Constitution, many refused. The resulting schism within the French church caused many devout Catholics to turn against the Revolution.

civil defense All nonmilitary actions taken to reduce loss of life and property resulting from enemy action. The threat of aerial attack on cities led to organized civil-defense planning in World War II. The British

government provided its people with gas masks, and nearly all countries trained citizens in fire fighting, rescue, and first aid. Blackouts reduced the glow from city lights that could guide enemy pilots; sirens warned of bombing attacks, and citizens took cover in air-raid shelters, basements, and subways. The postwar threat of nuclear attack prompted civil authorities to mark buildings that offered the best shelter from fallout. By the 1970s the West had largely abandoned civil-defense preparations as it became clear that surviving a direct nuclear attack was unlikely.

civil disobedience or passive resistance Refusal to obey government demands or commands and nonresistance to consequent arrest and punishment. It is used especially as a nonviolent and usually collective means of forcing government concessions and has been a major tactic of nationalist movements in Africa and India, of the U.S. civil rights movement, and of labour and antiwar movements in many countries. Civil disobedience is a symbolic or ritualistic violation of the law, rather than a rejection of the system as a whole. The civil disobedient, finding legitimate avenues of change blocked or nonexistent, sees himself as obligated by a higher, extralegal principle to break some specific law. By submitting to punishment, the civil disobedient hopes to set a moral example that will provoke the majority or the government into effecting meaningful political, social, or economic change. The philosophical roots of civil disobedience lie deep in Western thought. Cicero, Thomas Aquinas, and John Locke, among others, appealed to systems of natural law that take precedence over the laws created by communities or states (positive law). More modern advocates and practitioners of civil disobedience include Henry David Thoreau, Mohandas K. Gandhi, and Martin Luther King, Jr.

civil engineering Profession of designing and executing structural works that serve the general public, including bridges, canals, dams, harbors, lighthouses, roads, tunnels, and environmental works (e.g., water-supply systems). The modern field includes power plants, aircraft and airports, chemical-processing plants, and water-treatment facilities. Civil engineering today involves site investigations and feasibility studies, structural design and analysis, construction, and facilities maintenance. The design of engineering works requires the application of design theory from many fields (e.g., hydraulics, thermodynamics, nuclear physics). Research in structural analysis and the technology of materials such as steel and concrete has opened the way for new concepts and greater economy of materials. The engineer’s analysis of a building problem determines the structural system to be used. Structural designs are rigorously analyzed by computers to determine if they will withstand loads and natural forces.

civil law Body of law developed from Roman law and used in continental Europe and most former colonies of European nations, including the province of Quebec and the U.S. state of Louisiana. The most significant codifications of modern civil law were the French (Napoleonic Code) and the German (German Civil Code). The basis of law in civil-law jurisdictions is statute, not CUSTOM; civil law is thus to be distinguished from common law. In civil law, judges apply principles embodied in statutes, or law codes, rather than turning to case precedent. French civil law

African palm civet (Nandinia binotata)

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forms the basis of the legal systems of The Netherlands, Belgium, Luxembourg, Italy, Spain, most of France's former possessions overseas, and many Latin American countries. German civil law prevails in Austria, Switzerland, the Scandinavian countries, and certain countries outside Europe, such as Japan, that have westernized their legal systems. The term is also used to distinguish the law that applies to private rights from the law that applies to criminal matters. See also criminal law; tort.

civil liberty Freedom from arbitrary interference in one's pursuits by individuals or by government. The term is usually used in the plural. Civil liberties are protected explicitly in the constitutions of most democratic countries. (In authoritarian countries, civil liberties are often formally guaranteed in a constitution but ignored in practice.) In the U.S., civil liberties are guaranteed by the Bill of Rights and the 13th, 14th, and 15th Amendments to the Constitution of the United States. The Constitution's 13 th Amendment prohibits slavery and involuntary servitude; the 14th bars the application of any law that would abridge the "privileges and immunities" of U.S. citizens or deprive any person of "life, liberty, or property... without due process of law" or deny any person equal protection under the law; and the 15th guarantees the right of all U.S. citizens to vote. The related term civil right is often used to refer to one or more of these liberties or indirectly to the obligation of government to protect certain classes of people from violations of one or more of their civil liberties (e.g., the obligation to protect racial minorities from discrimination on the basis of race). In the U.S., civil rights are protected by the Civil Rights Act of 1 964 and subsequent legislation. See also American Civil Liberties Union.

civil religion Set of quasi-religious attitudes, beliefs, rituals, and symbols that tie members of a political community together. As originally formulated by Jean-Jacques Rousseau, the concept referred to the virtues that citizens need to serve the state. The concept was later elaborated by the American sociologist Robert N. Bellah (b. 1927), who found in the U.S. a strong sense of "American exceptionalism" and reverence for secular elements such as the national flag, the Constitution, the Founding Fathers, the annual holiday calendar, and the concepts of individualism and self-reliance. Another form of civil religion is presented by the example of Confucianism, where the nation is subordinated to a moral order.

Civil Rights Act of T 964 Comprehensive U.S. law intended to end discrimination based on race, colour, religion, or national origin. It is generally considered the most important U.S. law on civil rights since Reconstruction (1865-77). It guarantees equal voting rights (Title I); prohibits segregation or discrimination in places of public accommodation (Title II); bans discrimination, including sex-based discrimination, by trade unions, schools, or employers that are involved in interstate commerce or

that do business with the federal government (Title VII); calls for the desegregation of public schools (Title IV); and assures nondiscrimination in the distribution of funds under federally assisted programs (Title VI). A 1972 amendment, the Equal Employment Opportunity Act, extended Title VII coverage to employees of state and local governments and increased the authority of the Equal Employment Opportunity Commission, which was created in 1964 to enforce Title VII provisions. The act was proposed by Pres. John F. Kennedy in 1963 and strengthened and passed into law under Pres. Lyndon B. Johnson. See also civil rights movement.

civil rights movement Movement for racial equality in the U.S. that, through nonviolent protest, broke the pattern of racial segregation in the South and achieved equal rights legislation for blacks. Following the U.S. Supreme Court decision in Brown v. Board of Education of Topeka (1954), African American and white supporters attempted to end entrenched segregationist practices. When Rosa Parks was arrested in 1955 in Montgomery, Ala., an African American boycott of the bus system was led by Martin Luther King, Jr., and Ralph Abernathy. In the early 1960s the Student Nonviolent Coordinating Committee led boycotts and sit-ins to desegregate many public facilities. Using the nonviolent methods of Mohandas K. Gandhi, the movement spread, forcing the desegregation of department stores, supermarkets, libraries, and movie theatres. The Deep South remained adamant in its opposition to most desegregation measures, often violently; protesters were attacked and occasionally killed. Their efforts culminated in a march on Washington, D.C., in 1963 to support civil rights legislation. Following the assassination of John F. Kennedy, Pres. Lyndon B. Johnson persuaded Congress to pass the Civil Rights Act of 1 964, a victory that was followed by the Voting Rights Act in 1965. After 1965, militant groups such as the Black Panther Party split off from the civil rights movement, and riots in black ghettos and King’s assassination caused many supporters to withdraw. In the succeeding decades, leaders sought power through elective office and substantive economic and educational gains through affirmative action.

civil service Body of government officials employed in civil occupations that are neither political nor judicial. In well-ordered societies, they are usually recruited and promoted on the basis of a merit-and-seniority system, which may include examinations; elsewhere, corruption and patronage are more important factors. They often serve as neutral advisers to elected officials and political appointees. Though not responsible for making policy, they are charged with its execution. The civil service originated in the earliest known Middle Eastern societies; the modern European civil services date to 17th- and 18th-century Prussia and the electors of Brandenburg. In the U.S., senior officials change with each new administration. In Europe, regulations were established in the 19th century to minimize favouritism and to ensure a wide range of knowledge and skills among civil service officers. See also Chinese examination system; SPOILS SYSTEM.

Civil Service Act, Pendleton See Pendleton Civil Service Act

Civil War See American Civil War

Civil Wars, English See English Civil Wars

Civilian Conservation Corps (CCC) (1933^-2) U.S. unemploy-

ment program. One of the earliest New Deal programs, it was established to relieve unemployment during the Great Depression by providing national conservation work primarily for young unmarried men. Recruits lived in semimilitary work camps and received $30 a month as well as food and medical care. Projects included planting trees, building flood barriers, fighting forest fires, and maintaining forest roads and trails. It employed a total of 3 million men during its existence.

Cixi \'ts3-'she\ or Tz'u-hsi known as the Empress Dowager (b.

Nov. 29, 1835, Beijing, China — d. Nov. 15, 1908, Beijing) Imperial consort who controlled the Chinese Qing dynasty for almost half a century. A low-ranking concubine of the Xianfeng emperor (r. 1850-61), Cixi bore his only son, the future Tongzhi emperor, in 1856. After the emperor's death, Cixi joined a triumviral regency that governed in the name of her son, who was only 6 at his accession. During that period the Taiping and Nian rebellions were put down and the government was briefly revitalized. When Cixi's son died in 1875, Cixi violated the laws of succession and had her adoptive nephew enthroned. The regency thus continued, with Cixi becoming sole regent in 1884. In 1889 she nominally relinquished control but returned in 1898 to undo a set of radical reforms and had her nephew imprisoned in his palace. She supported the unsuccessful Boxer Rebellion, which had disastrous consequences for China. In 1902 she began to implement the reforms she had earlier reversed. Before she died, she ordered her nephew poisoned. See also Zeng Guofan; Zhang Zhidong.

Cixous \sek-'zus\, Helene (b. June 5, 1937, Oran, Alg.) Algerian-born French feminist critic, novelist, and playwright. She was reared in Algiers and has taught principally at the University of Paris. Her essays, in collections such as The Newly Born Woman (1975; with Catherine Clement), explore issues of sexual difference and female experience in writing. The Book of Promethea (1983) and other works reinterpret myths and the mythic past and analyze Western representations of women. Her novels include Inside (1969), Reading with Clarice Lispector (1989), and Osnabriick (1999).

Cizin \ke-'sen\ Mayan god of earthquakes and death. He may have represented one aspect of a malevolent underworld deity known by various names and in various guises. In Mayan manuscripts, he was depicted with the god of war in scenes of human sacrifice; he was also depicted as a dancing skeleton. His death collar was adorned with eyeballs dangling by their nerve cords. After the Spanish Conquest, he merged with the Christian devil, Satan.

Claiborne, William (b. c. 1587, Westmorland County, Eng. — d. c. 1677, Virginia) American colonial trader and public official. Emigrating to Virginia in 1621, he was appointed secretary of state of the colony and a member of the governor's royal council. He traded with the Indians of Chesapeake Bay and in 1631 established a successful trading post on Kent Island. Denied his claim to the island, he incited a revolt (1644) that ousted the Maryland governor and left Claiborne in charge of the colony until 1646. From 1652 to 1657 he was a member of the commission that governed Maryland.

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Clair, Rene orig. Rene-Lucien Chomette (b. Nov. 11, 1898, Paris, France — d. March 15, 1981, Neuilly-sur-Seine) French film director. He acted in silent films from 1920 until 1923, when he wrote and directed Paris qui dort. That film, along with Entr'acte (1924) and the satiric farce The Italian Straw Hat (1927), established his reputation as a leader of the avant-garde. He used sound creatively in early talkies such as Sous les toits de Paris (1930) and A nous la liberte! (1931). The Ghost Goes West (1935), made in England, was an international success. During World War II he directed several Hollywood films, including And Then There Were None (1945), then returned to France to make Le Silence est d'or (1947) and Les Belles de nuit (1952).

clam In general, any bivalve mollusk.

True clams, in the strict sense, have equal shells, closed by two opposing muscles, and a powerful, muscular, burrowing foot. They usually lie buried in the sand in shallow marine waters. Clams draw in and expel water for respiration and feeding through two tubes, the siphons. Species range in size from 0.004 in. to 4 ft (0.1 mm-1.2 m) across. Many species are edible, including the coquina clam, geoduck, quahog, and soft-shell clam.

dan Kinship group based on actual or purported descent from a common ancestor, as traced through the male (patrician) or the female (matriclan) line. Clans are normally exogamous, marriage within the clan being regarded as incest. Clans may segment into subclans or lineages, and genealogical records and myths may be altered to incorporate new members who lack kinship ties with the clan. Clan membership may be useful in ensuring mutual support and defense as well as in the mediation of disputes over property rights and the mode of residence after marriage. Some clans express their unity by means of a common emblem. See also EXOGAMY AND ENDOGAMY.

Clancy, Tom orig. Thomas Clancy (b. March 12, 1947, Baltimore, Md., U.S.) U.S. novelist. Clancy worked as an insurance agent before beginning his writing career. His first novel was the surprise best-seller The Hunt for Red October (1984; film, 1990), which virtually created the

“technothriller” genre, suspenseful novels that rely on extensive knowledge of military technology and espionage. Later successes include Red Storm Rising (1986), Patriot Games (1987; film, 1992), Clear and Present Danger (1989; film, 1994), Sum of All Fears (1991; film, 2000), and The Bear and the Dragon (2000).

clapboard Vkla-bardX Narrow board tapered toward one edge, used as siding to cover the exterior of a framed building. Clapboards are attached horizontally, each overlapping the next one down. Cleft oak clapboard was introduced to New England in the 17th century; later materials included pine, cypress, and cedar.

claque \'klak\ Group of people hired to clap (French, claquer) and show approval in order to influence a theatre audience. The claque dates from ancient times. Comedy competitions in Athens were often won by contestants who infiltrated audiences with paid supporters. The practice was widespread in Rome, where the emperor Nero established a school of applause. In 19th-century France most theatres had specialized claques: rieurs laughed loudly at comedies, pleureuses wept at melodramas, and bisseurs shouted for encores. The practice persists today in the operatic world.

Clare County (pop., 1996: 94,006), western Ireland. Bordered by the River Shannon and the Atlantic Ocean, it is located in the province of Munster, and its county seat is Ennis. It has peat- and bog-covered hills,

plateaus, lowlands, and limestone areas. Chief crops are oats and potatoes; livestock raising and fishing also are important. Evidence of prehistoric settlement includes many megaliths and some 2,000 fortified enclosures. There are numerous early Christian sites. The region remained under the lordship of the O’Briens until the 16th century despite Anglo-Norman colonization in the 12th century. It was made a shire in the reign of Elizabeth I. In 1828 Daniel O'Connell won the election in Clare that led to the emancipation of Catholics in Ireland.

Clare, John (b. July 13, 1793, Helpston, near Peterborough, Northamptonshire, Eng.— d. May 20, 1864, Northampton, Northamptonshire) British poet. Clare grew up in extreme rural poverty, with little access to books, but he had a prodigious memory and absorbed folk ballads. His Poems Descriptive of Rural Life and Scenery (1820) brought a short period of celebrity, but later volumes, including The Shepherd’s Calendar (1827) and The Rural Muse (1835), sold poorly. Suffering from penury and poor health, he fell prey to delusions and was placed in an asylum in 1837. After four years he briefly escaped; certified insane, he spent his final 23 years in another asylum, where he wrote some of his most lucid, lyrical poetry.

Clare of Assisi, Saint (b. July 16, 1194, Assisi, duchy of Spoleto — d. Aug. 11, 1253, Assisi; canonized 1255; feast day August 11) Founder of the order of Poor Clares (Clarissines). Born to a noble family, she became devoted to her fellow Assisian St. Francis. She refused to marry and in 1212 fled to the Porziuncola Chapel, where St. Francis received her vows. She later became abbess of a female religious community that included her sister, St. Agnes, and her mother. Her order, the Second Order of St. Francis, or Poor Clares, adopted the absolute poverty of St. Francis but was strictly cloistered, unlike its counterpart, the Franciscans. Still allied with the Franciscans, the Poor Clares are noted for their poverty and their life of penitential prayer led for the good of church and society.

Claremont Colleges Consortium of private colleges in Claremont, California, U.S. It comprises Pomona College (founded 1887), the Claremont Graduate School (1925), Scripps College (1926), Claremont McKenna College (1946), Harvey Mudd College (1955), and Pitzer College (1963). Each offers a broad range of degree programs, and they share a high academic reputation. The campuses are adjacent to one another and many facilities are shared.

Clarendon, Constitutions of (1164) Sixteen articles issued by King Henry II defining church-state relations in England. Designed to restrict ecclesiastical privileges and curb the power of the church courts, the constitutions provoked the famous quarrel between Henry and St. Thomas Becket. Among their controversial measures were the provisions that all revenues from vacant sees and monasteries reverted to the king, who had discretion in filling the vacant offices, and that clerics charged with serious crimes were to be tried in secular courts. Becket’ s martyrdom in 1170 forced Henry to moderate his attack on the clergy, but he did not repudiate the constitutions.

Clarendon, Edward Hyde, 1 st earl of (b. Feb. 18, 1609, Dinton, Wiltshire, Eng. — d. Dec. 9, 1674, Rouen, France.) English statesman and historian. A successful lawyer, he was also well known in literary circles. As a member of Parliament, he became an adviser to Charles I, recommending moderate policies, but was unable to prevent the English Civil Wars. He helped bring about the Restoration of Charles II and was created earl of Clarendon in 1661. As lord chancellor (1660-67), he dominated most aspects of the administration. His criticism of the king’s immorality eventually destroyed their friendship, and Parliament made him a scapegoat for the disasters of the Anglo-Dutch War of 1665. Dismissed as lord chancellor in 1667, he spent the rest of his life in exile in France, where he completed his History of the Rebellion and Civil Wars in England.

Clarendon, George William Frederick Villiers, 4th earl of

(b. Jan. 12, 1800, London, Eng. — d. June 27, 1870, London) British statesman. After serving as British ambassador to Spain (1833-39), he held various cabinet posts until Lord Aberdeen named him secretary of state for foreign affairs in 1853. Clarendon failed to prevent the outbreak of the Crimean War, and his performance during it was undistinguished, but he secured favourable terms for Britain at the Congress of Paris (1856). He continued in office under Lord Palmerston until 1858 and also served as foreign secretary under Earl Russell (1865-66) and William E. Gladstone (1868-70).

Clarendon Code (1661-65) Four acts, passed in England during the ministry of the earl of Clarendon, designed to cripple the power of the

Clair, photograph by Yousuf Karsh

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(Left) Quahog (Mercenaria); (ri glit)
soft-shell clam (Mya)

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Nonconformists, or Dissenters. The first, the Corporation Act, forbade municipal office to those not taking the sacraments at a parish church; the Act of Conformity excluded them from church offices; the Conventicle Act made meetings for Nonconformist worship illegal; and the Five-Mile Act forbade Nonconformist ministers to live or visit within five miles of any place where they had ministered.

clarinet Single-reed woodwind instrument. It is a standard member of both orchestras and bands. It has a cylindrical bore and a flared bell, and it is usually made of African blackwood (Dalbergia melanoxylon, more commonly called renadilla). It has a 3Vfc-octave range; its lower register is rich and its top register is brilliant. It developed from the slightly older two-key chalumeau; the German flute maker Johann Christoff Denner (1655-1707) is said to have invented it at the beginning of the 18th century. The B-flat clarinet is the standard instrument today; the A clarinet often replaces it in sharp keys. Clarinets with the fingering system devised by Theobald Boehm are standard in the U.S., Great Britain, and France; those employing an older fingering style are used in Germany and Russia. Clarinets of other sizes include the C clarinet, much used in the Classical period and often preserved in German orchestration; octave clarinets in A, used in large European bands; and sopranino clarinets in F and later E-flat. The B-flat bass clarinet, with its rich timbre, is the next most frequently employed member of the clarinet family. Contrabass clarinets are made in E-flat or in B-flat.

Clark, Champ orig. James Beauchamp Clark (b. March 7, 1850, near Lawrenceburg, Ky., U.S. — d. March 2, 1921, Washington, D.C.) U.S. politician. Clark moved to Missouri in 1876 and settled at Bowling Green. He was successively a newspaper editor, a prosecuting attorney, and a state legislator; he was then elected to the U.S. House of Representatives, where he served 13 terms (1893-95, 1897-1921). A follower of William Jennings Bryan, he supported agrarian measures. As a member of the House rules committee in 1910, he led the revolt against Joseph Cannon and succeeded him as speaker (1911-19). At the 1912 Democratic Party convention, Clark was a leading contender for the presidential nomination until Bryan switched his support to Woodrow Wilson.

Clark, Dick in full Richard Wagstaff Clark (b. Nov. 30, 1929, Mount Vernon, N.Y., U.S.) U.S. television personality. He worked as a radio and television announcer before beginning his long engagement as host of the TV show American Bandstand (1956–89), a showcase for popular music. He formed his own production company in 1956 and produced over 30 series, 250 specials, and 20 TV movies.

Clark, George Rogers (b. Nov. 19, 1752, Albemarle county, Va. — d.

Feb. 13, 1818, near Louisville, Ky., U.S.) Frontier military leader in the American Revolution. The brother of William Clark, he worked as a surveyor in Kentucky in the mid- 1770s. During the Revolution he raised troops and defended the region against the British and Indians. He captured settlements along the Mississippi River in the Old Northwest (Illinois), and in 1780 he helped defeat a British attempt to capture St. Louis. Appointed an Indian commissioner, he helped conclude a treaty with the Shawnee. In 1793 he became involved in the Citizen Genet Affair.

Clark, Helen (b. Feb. 26, 1950, Hamilton, N.Z.) New Zealand prime minister. In 1999 she became the first woman in New Zealand to hold the office of prime minister immediately following an election. She received bachelor's (1971) and master's (1974) degrees in political science at the University of Auckland, where she taught from 1973 to 1981.

Elected to Parliament in 1981, she held various cabinet portfolios beginning in 1987. She served as deputy prime minister in 1989-90 and was appointed to the Privy Council in 1990, both firsts for a woman in New Zealand. In 1993 she was elected head of the Labour Party, becoming the first woman in New Zealand to head a major party. In 1999, when the Labour Party was able to form a governing coalition, Clark was elected prime minister.

Clark, James H. (b. 1944, Plainview, Tex., U.S.) U.S. businessman. He dropped out of high school to join the navy. He received his Ph.D. in computer science from the University of Utah and taught at UC-Santa Cruz (1974-78) and Stanford (1979-82). He founded Silicon Graphics in

1981 and served as its chairman 1982-94, building it into a billion-dollar company that produced workstations for graphics-intensive applications. In 1994 he cofounded Netscape Communications, whose graphical interface Web browser revolutionized the Internet by making it easy to access Internet documents.

Clark (of Saltwood), Kenneth (Mackenzie) Clark, Baron (b.

July 13, 1903, London, Eng. — d. May 21, 1983, Hythe) British art historian and administrator. Born to a wealthy family, he studied at the University of Oxford. After two years of study with Bernard Berenson in Florence, he served as keeper of fine art at Oxford's Ashmolean Museum (1931-34) and director of London's National Gallery (1934-39). He was involved in academic research and public service for most of his life. He published widely and became internationally known in 1969 as the writer and host of the BBC series Civilisation, a survey of European art from the Middle Ages to the 20th century.

Clark, Mark (Wayne) (b. May 1, 1896, Madison Barracks, N.Y., U.S. — d. April 17, 1984, Charleston, S.C.) U.S. army officer. After graduating from West Point, he served in Europe in World War I. In 1942 he was appointed chief of staff of army ground forces. He commanded the U.S. landing at Salerno, Italy, in September 1943 and received the sur-

render of the government of Pietro Badoglio. He then directed the hard-fought campaign to wrest the Italian peninsula from Axis control, taking Rome in June 1944 and receiving the surrender of the last German forces in northern Italy in May 1945. In the Korean War he commanded all UN troops (1952-53). After his retirement he served as president of The Citadel military college (1954-66).

Clark, Tom orig. Thomas Campbell (b. Sept. 23, 1899, Dallas, Texas, U.S. — d. June 13, 1977, New York, N.Y.) U.S. jurist. He studied law at the University of Texas and entered private practice in Dallas. As a civil district attorney, he became involved in Democratic Party politics. At the U.S. Justice Department (1937-45), he worked primarily on anti-trust and war-fraud cases. As U.S. attorney general (1945) he gained a reputation for his vigorous antisubversive programs and his efforts to broaden the powers of Federal Bureau of Investigation. Appointed to the Supreme Court of the United States (1949), he retained his strong views on subversive activities but was also a frequent supporter of civil liberties. He resigned in 1967 when his son, Ramsey Clark (b. 1927), was appointed U.S. attorney general.

Clark, William (b. Aug. 1, 1770, Caroline county, Va. — d. Sept. 1, 1838, St. Louis, Mo., U.S.) U.S. explorer and soldier. The brother of George Rogers Clark, he joined the army and participated in Indian campaigns under Anthony Wayne. After resigning his commission, he was recruited by his former army friend Meriwether Lewis to help lead the first overland expedition to the Pacific coast and back. Proving a daring and resourceful leader, he is credited with rescuing the famed Lewis and Clark Expedition (1804-06) from disaster on more than one occasion. He also served as mapmaker and artist, portraying with meticulous detail animal life observed en route. Later, as governor of the Missouri Territory (181 3—21), he became known for his effective diplomacy with the Indians.

Clark Fork River, Montana and Idaho, U.S. Rising near Butte, Mont., it flows in an irregular course for about 300 mi (480 km) to enter Pend Oreille Lake in northern Idaho. Glacier National Park, wildlife preserves, and national forests are in the adjacent mountains, which are noted for their spectacular scenery.

Clarke, Arthur C(harles) (b. Dec. 16, 1917, Minehead, Somerset, Eng.) British science-fiction writer. He first published stories while in the Royal Air Force and, after earning a degree in physics and mathematics, wrote such novels as Childhood’s End (1953), Earthlight (1955), Rendezvous with Rama (1973), and The Fountains of Paradise (1979). He collaborated with Stanley Kubrick in making 2001: A Space Odyssey (1968, film and novel). Some of Clarke’s ideas have proved remarkably prescient. Since the 1950s he has lived in Sri Lanka. In 1997 he published 3001: The Final Odyssey. He was knighted in 2000.

class, social Group of people within a society who possess the same socioeconomic status. The term was first widely used in the early 19th century, following the industrial and political revolutions of the late 18th century. The most influential early theory of class was that of Karl Marx, who focused on how one class controls and directs the process of production while other classes are the direct producers and the providers of services to the dominant class. The relations between the classes were

Helen Clark, 2005.

SEAN GALLUP/GETTY IMAGES

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thus seen as antagonistic. Max Weber emphasized the importance of political power and social status or prestige in maintaining class distinctions. Despite controversies over the theory of class, there is general agreement on the characteristics of the classes in modem capitalist societies. In many cases the upper class has been distinguished by the possession of largely inherited wealth, while the working class has consisted mostly of manual labourers and semiskilled or unskilled workers, often in service industries, who earn moderate or low wages and have little access to inherited wealth. The middle class includes the middle and upper levels of clerical workers, those engaged in technical and professional occupations, supervisors and managers, and such self-employed workers as small-scale shopkeepers, businesspeople, and farmers. There is also often an urban substratum of permanently jobless and underemployed workers termed the “underclass.” See also bourgeoisie.

class action In law, an action in which a representative plaintiff sues or a representative defendant is sued on behalf of a class of plaintiffs or defendants who have the same interests in the litigation as their representative and whose rights or liabilities can be better determined as a group than in a series of individual suits. Class-action suits that received national attention in the U.S. include a suit brought against manufacturers of Agent Orange by Vietnam veterans exposed to the herbicide (settled in 1984) and a suit concerning the effects of passive smoking brought against tobacco firms (settled in 1997).

Classical architecture Architecture of ancient Greece and Rome, especially from the 5 th century bc in Greece to the 3rd century ad in Rome, that emphasized the column and pediment. Greek architecture was based chiefly on the post-and-beam system, with columns carrying the load. Timber construction was superseded by construction in marble and stone. The column, a unit human in scale, was used as a module for all of a temple’s proportions. The Doric order, probably the earliest, remained the favorite of the Greek mainland and western colonies. The Ionic order developed in eastern Greece; on the mainland, it was used chiefly for smaller temples and interiors. The greatest Greek architectural achievement was the Athens acropolis. By the late 5th century bc, the orders were applied to such structures as stoas and theaters. The Hellenistic Age produced more elaborate and richly decorated architecture, with often colossal buildings. Many of the great buildings were secular rather than religious, and the Ionic and especially the newer Corinthian orders were widely used. The Romans used the Greek orders and added two new ones (Tuscan and Composite); the Corinthian was by far the most popular. Roman architects used columns not only as functional bearing elements,

but also as applied (engaged) decoration. Though rigidly adhering to symmetry, the Romans used a variety of spatial forms. Whereas Greek temples were isolated and almost always faced east-west, Roman temples were oriented with respect to other buildings. Roman columns carried arches as well as entablatures, permitting greater spatial freedom. The discovery of concrete enormously facilitated construction using the arch, vault, and dome, as in the Pantheon. Other public buildings included basilicas, baths (see thermae), amphitheaters, and triumphal arches. Classical architecture may also refer to architecture of later periods that employs Greek or Roman forms.

classical economics School of economic thought largely centred in Britain that originated with Adam Smith and reached maturity in the works of David Ricardo and John Stuart Mill. The theories of the classical school were mainly concerned with the dynamics of economic growth. Reacting against mercantilism, classical economics emphasized economic freedom. It stressed ideas such as laissez-faire and free competition. Many of the fundamental principles of classical economics were set forth in Smith's Wealth of Nations (1776), in which he argued that a nation's wealth was greatest when its citizens pursued their own self-interest. Neoclassical economists such as Alfred Marshall showed that the forces of supply and demand would ration economic resources to their most effective uses. Smith's ideas were elaborated and refined by Ricardo, who formulated the principle that the price of goods produced and sold under competitive conditions tends to be proportionate to the labour costs incurred in producing them. Mill's Principles of Political Economy (1848) gave the ideas greater currency by relating them to contemporary social conditions. Among those who have modified classical economics to reach very different conclusions are Karl Marx and John Maynard Keynes.

Classicism In the arts, the principles, historical tradition, aesthetic attitudes, or style of the art of ancient Greece and Rome. The term may refer either to work produced in antiquity or to later works inspired by those

of antiquity; the term Neoclassicism usually refers to art produced later but inspired by antiquity. More broadly, Classicism refers to the adherence to virtues regarded as characteristic of Classicism or as universally and enduringly valid, including formal elegance and correctness, simplicity, dignity, restraint, order, and proportion. Classicism is often opposed to Romanticism. Periods of Classicism in literature, music, and the visual arts have generally coincided.

Classicism and Neoclassicism Art-historical tradition or aesthetic attitudes based on the art of ancient Greece and Rome. "Classicism" refers to the art produced in antiquity or to later art inspired by that of antiquity; "Neoclassicism" refers to art inspired by that of antiquity and thus is contained within the broader meaning of "Classicism." Classicism is traditionally characterized by harmony, clarity, restraint, universality, and idealism. In the visual arts, Classicism has generally denoted a preference for line over colour, straight lines over curves, and the general over the particular. The Italian Renaissance was the first period of thorough Classicism after antiquity. Neoclassicism became the dominant aesthetic movement in Europe in the late 18th and early 19th centuries, as practiced by Antonio Canova and Jacques- Louis David. It bred a reaction in favour of subjective feeling, longing for the sublime, and a taste for the bizarre that came to be termed Romanticism. Recurring alternations between Classical and non-Classical ideals have often characterized West-

ern aesthetics. See also Classical architecture.

Claude Lorrain Vklod-lo-'ra n \orig. Claude Gellee (b. c. 1600, Chamagne, France — d. Nov. 23, 1682, Rome) French painter. Born in the duchy of Lorraine, he went to Rome as a youth, and there trained with the landscape and fresco painter Agostino Tassi and encountered the work of Nicolas Poussin. He became known as the master of the ideal landscape, a view of nature more beautiful and harmonious than nature itself; his landscapes and coastal scenes contain architectural fragments and figures. His reputation is based particularly on his sensitivity to the tonal values of light and atmosphere. By the 1630s he was well known and successful, with illustrious patrons among the French and Italian aristocracy. His work influenced the Dutch painters in Rome in the 1630s and ’40s, as well as the entire course of European landscape painting. Some 250 paintings and over 1,000 drawings by him survive.

Claudel \kIo-'del\, Camille (-Rosalie) (b. Dec. 8, 1864, Villeneuve-sur-Fere, Fr. — d. Oct. 19, 1943, Montdevergues asylum, Montfavet) French sculptor. She was educated with her brother, Paul Claudel, and by her teens she was a skilled sculptor. In 1881 she moved with her family to Paris and entered the Colarossi Academy. The following year she met the renowned sculptor Auguste Rodin; she is best known today as his student, collaborator, model, and mistress. She contributed whole figures and parts of figures to Rodin’s projects, particularly The Gates of Hell (1 880—1900). Claudel exhibited her own work successfully at the official salons and in galleries, but she also destroyed many pieces. In 1913, still distraught from her break with Rodin in 1898, she was committed to a mental institution, and from 1914 until her death she lived in a rest home.

Claudel \klo-'del\, Paul (-Louis-Charles-Marie) (b. Aug. 6, 1868, Villeneuve-sur-Fere, France — d. Feb. 23, 1955, Paris) French poet, playwright, and diplomat. He converted to Catholicism at age 18. His brilliant diplomatic career began in 1892, and he eventually served as ambassador to Japan (1921-27) and the U.S. (1927-33). At the same time he pursued a literary career, expressing in poetry and drama his conception of the grand design of creation. He reached his largest audience through plays such as Break of Noon (1906), The Hostage (1911), Tidings Brought to Mary (1912), and his masterpiece, The Satin Slipper (1929); recurring themes in these works are human and divine love and the search for salvation. He wrote the librettos for Darius Milhaud’s opera Christopher Columbus (1930) and Arthur Honegger’s oratorio Joan of Arc (1938). His best-known poetic work is the confessional Five Great Odes (1910).

Claudius in full Tiberius Claudius Caesar Augustus Germanicus orig. Tiberius Claudius Nero Germanicus (b. Aug. 1, 10 bc, Lugdunum [Lyon], Gaul — d. Oct. 13, ad 54) Roman emperor (ad 41-54). Nephew of Tiberius, Claudius became emperor unexpectedly after Caligula was murdered. Sickly, clumsy, unattractive, and scholarly, he wrote several histories, none of which survive. He was ruthless toward individual senators and the equites (see eques) and tended to disfavour the upper classes but catered to the freedmen. The invasion of Britain in 43 was part of his general expansion of frontiers; he also annexed Mauretania in northern Africa, Lycia in Asia Minor, and Thrace, and he made

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Judaea a province. He encouraged urbanization, spent lavishly on public works, and extended Roman citizenship throughout the empire.

Having executed his scheming third wife, Valeria Messalina, in 48, he married his niece Agrippina the Younger. She pressured Claudius into naming her son Lucius (later Nero) heir instead of his own son Britannicus. Claudius may have been poisoned by Agrippina.

Claudius Caecus Yse-kosV
Appius (fl. 3rd century bc) Roman statesman and legal reformer.

Elected censor, Appius extended the rights of the sons of freedmen and the landless. He completed the Aqua Appia, Rome’s first aqueduct, and started construction of the Appian Way. He was consul in 307, censor a second time in 296, and praetor in 295. By publishing the legis actiones (“methods of legal practice”) and lists of court days, he provided greater public access to the legal system. In his old age he convinced the Senate to drive the Epirite king Pyrrhus from southern Italy.

Claudius I, detail of a bust found near Priverno; in the Vatican Museums.

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Clausewitz Vklau-z9-,vits\, Carl (Philipp Gottlieb) von (b. June 1, 1780, Burg, near Magdeburg,

Prussia — d. Nov. 16, 1831, Breslau,

Silesia) Prussian general and author.

Born to a poor middle-class professional family, he joined the Prussian army at age 12 and entered the War College in Berlin in 1 801 . After serving with distinction in the Napoleonic Wars, he became a general and was appointed director of the War College

(1818). His major work on strategy,

On War (1832-37), analyzed the workings of military genius by isolating the factors that decide success in war. Rather than producing a rigid system of strategy, he emphasized the necessity of a critical approach to strategic problems. He asserted that war is a tool for achieving political aims rather than an end in itself

(“merely the continuation of policy by other means”) and argued that defensive warfare is both militarily and politically the stronger position. He also advocated the concept of TOTAL war. Published posthumously. On War had a profound influence on modern military strategy.

Carl von Clausewitz, lithograph by Franz Michelis after an oil painting by Wilhelm Wach, 1 830.

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clavichord Early keyboard instrument, an important forerunner of the piano. It flourished c. 1400-1800, especially in Germany. It is usually rectangular, with the keyboard inset. The strings are struck by metal tangents, rather than plucked as on the harpsichord. The tangent becomes the endpoint of the vibrating string; thus the point where it strikes determines the pitch. So-called fretted clavichords permit more than one tangent to strike a single pair of strings (which somewhat limits the notes that can be sounded simultaneously); unfretted clavichords use only one tangent per pair of strings. The player’s touch can produce dynamic variation; variation in finger pressure can even produce vibrato. Its tone is silvery and soft, best suited for intimate music.

clay Soil particles with diameters less than 0.005 mm; also a material composed essentially of clay particles (see clay mineral). In soils, clays provide the environment for almost all plant growth. The use of clay in pottery making predates recorded human history. As building materials, clay bricks (baked and as adobe) have been used in construction since earliest times. Kaolin, or china clay, is required for the finer grades of ceramic materials; used for paper coating and filler, it gives the paper a gloss, permitting high-quality reproduction, and increases paper opacity. Clay materials have many uses in engineering; earth dams are made impermeable

Clay, Lucius D(uBignon) (b. April 23, 1897, Marietta, Ga., U.S. — d. April 16, 1978, Cape Cod, Mass.) U.S. army officer. After graduating from West Point, he served in various military engineering assignments. In World War II he directed the U.S. Army procurement program (1 942 — 44). In 1945 he was appointed deputy military governor of the U.S. zone of occupation in defeated Germany. Two years later he was elevated to commander in chief of U.S. forces in Europe and military governor of the U.S. zone. In 1948-49 he organized the successful Allied airlift of food and supplies into Berlin during the Soviet blockade of that city (see Berlin blockade and airlift). After retiring in 1949, he entered private business

and became an unofficial adviser to Pres. Dwight D. Eisenhower.

clay mineral Any of a group of important hydrous aluminum silicates with a layered structure and very small (less than 0.005 mm or microscopic) particle size. They are usually the products of weathering. Clay minerals occur widely in such sedimentary rocks as mudstones and shales, in marine sediments, and in soils. Different geologic environments produce different clay minerals from the same parent rock. They are used in the petroleum industry (as drilling muds and as catalysts in refining) and in the processing of vegetable and mineral oils (as decolorizing agents).

Clayton, John Middleton (b. July 24, 1796, Dagsboro, Del., U.S. — d. Nov. 9, 1856, Dover, Del.) U.S. politician. He served as Delaware's secretary of state (1826-28) and chief justice (1837). He also represented Delaware in the U.S. Senate (1829-36, 1845-49). As U.S. secretary of state (1849-50) under Pres. Zachary Taylor, he negotiated the Clayton-Bulwer Treaty.

Clayton-Bulwer Treaty (1850) Compromise agreement designed to harmonize contending British and U.S. interests in Central America. The treaty provided that the two countries jointly control and protect what was to become the Panama Canal. The Clayton-Bulwer treaty was superseded

to water by a core of clay, and water loss in canals may be reduced by lining the bottom with clay (called puddling). The essential raw materials of Portland cement include clays.

Clay, Cassius See Muhammad Au

Clay, Cassius Marcellus (b. Oct. 19, 1810, Madison county, Ky., U.S. — d. July 22, 1903, Whitehall, Ky.) U.S. abolitionist and politician. The son of a slaveholder and a relative of Henry Clay, he was strongly influenced by the abolitionist ideas of William Lloyd Garrison. In 1845 he founded the antislavery publication True American in Lexington, Ky., but he was forced by opponents to move it to Cincinnati, Ohio, and then to Louisville, Ky., where it was renamed The Examiner. He helped found the Republican Party in 1854. As U.S. minister to Russia (1861-62, 1 863—69), he helped negotiate the Alaska Purchase.

Clay, Henry (b. April 12, 1777, Hanover county, Va., U.S. — d. June 29, 1852, Washington, D.C.) U.S. politician. He practiced law from 1797 in Virginia and then in Kentucky, where he served in the state legislature (1803-09). He was elected to the U.S. House of Representatives (1811-14, 1815-21,

1823-25); as House speaker (181 1—

14), he was among those who propelled the U.S. into the War of 1812. He supported a national economic policy of protective tariffs, known as the American System, a

national bank, and improvements to internal transportation. His support of the Missouri Compromise earned him the nicknames “The Great Pacificator” and “The Great Compromiser.” After his bid for the presidency in 1824 fell short, Clay threw

his support to John Quincy Adams,

who made him his secretary of state

(1825-29). He served in the U.S. Senate (1806-07, 1810-11, and 1831-42), where he supported the compromise tariff of 1833. He was the National Republican Party candidate for president in 1832 and the Whig Party candidate in 1844. In his last Senate term (1849-52) he argued strongly for passage of the Compromise of 1 850.

Henry Clay, by Frederick and William Langenheim, 1 850.

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in 1901 by the Hay-Pauncefote Treaty, under which the British government agreed to allow the U.S. to construct and control the canal.

Clazomenae Mdo-'za-mo-.neV Ancient Ionian Greek city, Anatolia. Founded on the mainland, the city was subsequently moved to a nearby island. Part of the Ionian Dodecapolis, it was known for its painted terra-cotta sarcophagi (6th century bc). During the 5th century bc it was controlled by Athens, during which time the philosopher Anaxagoras was born there. It became subject to the Persian Achaemenian dynasty in 387 bc. A half century or so later Alexander the Great built a causeway connecting the city to the mainland. Under the Romans (see Roman Republic and Empire) it became part of the province of Asia.

Clear Grits Political movement in Canada West (now Ontario). It developed in 1849 within the Reform Party in opposition to the province’s premier, Robert Baldwin, who advocated reforms that included the use of crown lands to support the Protestant churches. It allegedly took its name from the motto “All sand and no dirt, clear grit all the way through.” Its early leader was Peter Perry; after his death in 1851, control gradually passed to George Brown. It eventually joined other groups to form the Liberal Party of Canada; the term “Grit” denotes a member of that party.

clearinghouse Institution established by firms engaged in similar

activities to enable them to offset transactions with one another in order to limit payment settlements to net balances. Clearinghouses play an important role in settling international payments and the transactions of banks, railroads, and stock and commodity exchanges. Bank clearing-houses are usually voluntary associations of local banks set up to simplify the exchange of checks, drafts, and notes, as well as to settle balances. Increasingly, the automated clearinghouse (ACH) is used to transfer funds electronically. The clearinghouse idea was applied to various forms of trade from an early time. The Amsterdam Exchange Bank, founded in 1609, became Europe’s largest clearinghouse and made the city an international financial centre. The first modern bank clearinghouse was established in London in 1773. The first bank clearinghouse in the U.S. was established in 1853.

cleavage Tendency of a crystalline substance to split into fragments bounded by plane surfaces. Cleavage surfaces are seldom as flat as crystal faces, but the angles between them are highly characteristic and valuable in identifying a crystalline material. Cleavage occurs on planes where the atomic bonding forces are weakest; for example, galena cleaves parallel to all faces of a cube. Cleavage is described by its direction (as cubic, prismatic, basal) and by the ease with which it is produced. A perfect cleavage produces smooth, lustrous surfaces. Other degrees include distinct, imperfect, and difficult. See also fracture.

Cleese, John (Marwood) (b. Oct. 27, 1939, Weston-super-Mare, Somerset, Eng.) British actor and screenwriter. He wrote and performed comedy material for British television in the 1960s before helping create the popular comedy show Monty Python's Flying Circus (1969-74), which later won a large U.S. following with its surreal brand of humour. He cowrote and acted in the television series Fawlty Towers and collaborated with the rest of the Monty Python troupe on films such as Monty Python and the Holy Grail (1975), The Life of Brian (1979), and Monty Python ’s The Meaning of Life (1983). His other films include Silverado (1985) and A Fish Called Wanda (1988).

clef French "key" Musical notation symbol at the beginning of a staff to indicate the pitch of the notes on the staff. Clefs were originally letters, identifying letter-named pitches, that were affixed to one or more of the staff’s lines (thus providing a “key” to their identity). Knowing the identity of a single line permitted the musician to identify all the other lines and spaces above and below. Clefs were first regularly used in the 12th century. The Gothic letter forms of G and F evolved into the modem treble and bass clefs, respectively; the letter C evolved into the rarer alto, tenor, baritone, and soprano clefs.

cleft palate Fairly common congenital disorder in which a fissure forms in the roof of the mouth. It may affect only the soft palate or extend through the hard palate, so that the nasal cavity opens into the mouth. The septum (dividing wall) between the nostrils is often absent. Cleft lip, a fissure in the lip beneath the nostril, or other abnormalities may accompany it. Cleft palate limits the ability of an infant to suck, which may lead to malnutrition, and causes speech problems in childhood. Surgical repair, usually at about 18 months of age, forms an airtight separation between

nose and mouth. Speech training is still needed, and patients may have a high risk of nose, ear, and sinus infections.

Cleisthenes Vklls-tho-.nezN of Athens (b. c. 570 bc — d. c. 508) Athenian statesman and chief archon (525-524), regarded as the founder of Athenian democracy. A member of the Alcmaeonid family, he allied himself with the Ecclesia (citizens' assembly) in 508 and imposed democratic reforms by which the basis of organization was changed from family and clan to locality. The four blood tribes were replaced by 10 local tribes, each with representation from city, coast, and hill areas. The boule (representative council) grew to 500 members. He based all his reforms on isonomia ("equal rights for all").

Cleitias Vkll-te-9s\ or Kleitias or Clitias (fl. c. 580-550 bc, Greece) Greek vase painter and potter. An outstanding master of the Archaic period, he executed the decorations on the Frangois Vase (c. 570 bc), discovered in 1844 in an Etruscan tomb.

Painted in the black-figure style (see black-figure pottery), the large vase, signed and decorated with more than 200 figures, is among the greatest treasures of Greek art. Other vases and fragments attributed to him are in the Acropolis Museum, Athens.

clematis Vkle-ms-tss, kli-'ma-t9s\

Any of the more than 200 species of perennial, chiefly climbing shrubs of the genus Clematis (buttercup family), found through most of the world, especially in Asia and North America. Many species are cultivated in North America for their attractive flowers, either solitary or in large clusters. The leaves usually are compound. Common species include woodbine; traveler's joy, or old-man' s-beard (C. vitalba)', virgin's bower (C. cirrhosa); and vine bower (C. viticella). The most popular horticultural hybrids are of primarily three species: C. florida, C. patens, and C. jackmanii.

Clemenceau \kla-ma n -so,\ English \ l kle-m9n-'so\, Georges (b. Sept. 28, 1841, Mouilleron-en-Pareds, France — d. Nov. 24, 1929, Paris) French statesman and journalist. A doctor before turning to politics, he served in the Chamber of Deputies (1876-93), becoming a leader of the radical republican bloc. He founded the newspapers La Justice (1880), L'Aurore (1897), and L' Homme Libre (1913) and came to be ranked among the foremost political writers of his time. His support for Alfred Dreyfus brought him into favour, and he served in the Senate (1902-20). He served as interior minister in 1906 and as premier (1906-09). During World War 1, at age 76, he became premier again (1917-20), and his steadfast pursuit of the war won him the title "Father of Victory." He also helped frame the postwar Treaty of Versailles, endeavouring to reconcile French interests with those of Britain and the U.S. Defeated in a presidential election in 1920, he retired from politics.

Clemens, (William) Roger (b. Aug. 4, 1962, Dayton, Ohio, U.S.) U.S. baseball pitcher. Clemens played for the Boston Red Sox (1984-96), Toronto Blue Jays (1997-98), New York Yankees (1999-2003), and Hous-

ton Astros (from 2004). In 1986 he became the first pitcher to strike out 20 batters in a single (nine-inning) game; he later tied his own record (1996). He won the Cy Young Award for best pitcher an unprecedented seven times (1986, 1987, 1991, 1997, 1998, 2001, 2004).

Clement V orig. Bertrand de Got (b. c. 1260, Bordelais region, France — d. April 20, 1314, Roquemaure, Provence) Pope (1305-14), the first to reside at Avignon, France. He became archbishop of Bordeaux in 1299 and was elected pope six years later. By creating a majority of French cardinals, he ensured the election of a line of French popes. He moved the seat of the papacy to Avignon, under pressure from King Philip IV of France, who also forced Clement to annul Pope Boniface VIITs decisions that were unfavourable to France. The king also compeled the pope to dissolve the Templars, which Philip brutally suppressed. Clement opposed Holy Roman Emperor Henry VI I after 1313 and appointed the king of Naples as imperial vicar on Henry's death. His decretals, the Clementinae, were a notable contribution to canon law.

"Mask of Medusa/' top view of stand made by Ergotimos and painted by Cleitias, c. 560 bc; in the Metropolitan Museum of Art, New York City.

COURTESY OF THE METROPOLITAN MUSEUM OF ART, NEW TORK, FLETCHER FUND, 1931

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Clement VI orig. Pierre Roger (b. c. 1291, Corezze, Aquitaine — d. Dec. 6, 1352, Avignon, Provence) Pope (1342-52). Archbishop of Sens and Rouen, he was made cardinal in 1338 and was consecrated pope at Avignon four years later (see Avignon papacy). He launched a Crusade against Smyrna in 1344, ending the piracy of the Ottoman Turks. He also restored papal authority in the Romagna region, which was disputed by families of the Italian nobility. In exchange for his protection, Joan I of Naples sold him Avignon. Clement opposed the Franciscan ascetics known as the Spirituals, enlarged the papal palace, and fostered art and scholarship.

Clement VII orig. Giulio de' Medici (b. May 26, 1478, Florence — d. Sept. 25, 1534, Rome) Pope (1523-34). The illegitimate son of Giuliano de' Medici (see Medici family), he was raised by his uncle Lorenzo de' Medici. In 1513 he was made archbishop of Florence and cardinal by his cousin Pope Leo X. He commissioned art from Raphael and Michelangelo. A weak and vacillating political figure mainly interested in advancing Medici interests, Clement allied with France in 1527, which led to Emperor Charles V's sack of Rome. Clement's indecisiveness complicated Henry VIII' s request for an annulment of his marriage to Catherine of Aragon, which contributed to Henry's decision to break with the church in

Rome. His poor leadership also allowed the Reformation to develop further.

Clement of Alexandria, Saint Latin Titus Flavius Clemens (b.

150, Athens — d. between 211 and 215, Palestine; Western feast day November 23; Eastern feast day November 24) Christian apologist, missionary theologian to the Hellenistic world, and leader of the catechetical school at Alexandria. He was converted to Christianity by Pantaenus, a former Stoic who preceded him as head of the Alexandria school. Clement believed that philosophy was for the Greeks what the Law of Moses was for the Jews, a preparatory discipline leading to the truth. He asserted that men lived first as citizens of heaven and second as earthly citizens, and he defended the right of an enslaved people to rebel against its oppressors. Persecution by the emperor Septimius Severus in 201-202 obliged him to leave Alexandria and take refuge with Alexander, bishop of Jerusalem. He was revered as a saint in the Latin church until 1586, when doubts about his orthodoxy led to the removal of his name from the list of Roman saints.

Clemente \kb-'men-ta\, Roberto (b. Aug. 18, 1934, Carolina, PR. — d. Dec. 31, 1972, off the coast of Puerto Rico) Puerto Rican baseball player. Clemente played in the minor leagues in his native land before joining the Pittsburgh Pirates in 1955. He led the National League in hitting in 1961, 1964, 1965, and 1967, and batted .362 in two World Series (1960, 1970). He was also known for his fielding, throwing, and base stealing. His career was cut short when he died in the crash of an airplane loaded with relief supplies he had collected for Nicaraguan earthquake victims.

Clementi, Muzio (b. Jan. 24,

1752, Rome, Papal States — d. March 10, 1832, Evesham, Worcestershire,

Eng.) Italian-born English pianist, composer, publisher, and manufacturer. Taken to England at age 13 by a wealthy English traveler who had heard his organ playing, he pursued a rigid course of music studies for seven years while living on his patron’s country estate. His keyboard playing and early sonatas gained him renown in London. In 1781 he and Wolfgang A. Mozart competed before the emperor, and he later toured extensively as conductor and pianist. In 1798 he restarted a successful music-publishing and piano-manufacturing firm. His piano pieces were highly influential, and he taught many leading pianists. His works include more than 100 piano sonatas and Gradus ad Parnassum, 3 vol. (1817-26), a popular pedagogical set of 100 diverse piano pieces.

Cleomenes \kle-'a-m9-,nez\ I (d. 491 bc) Spartan king (519-491). An Agiad (descendant from the legendary founders of Sparta), he ruled jointly with Demaratus. In 510 he expelled the tyrant Hippias from Athens, then supported the oligarchic party against the democratic Cleisthenes and

refused to help Athens combat Persia. His policies did much to solidify Sparta’s position as the leading power in the Peloponnesus. He bribed the oracle at Delphi to depose Demaratus, but he was discovered and fled. Though reinstated, he went insane and committed suicide.

Cleomenes III (d. 219 bc) Agiad Spartan king (r. 235-222). Seeking to institute social reforms, in 227 he canceled debts, redistributed land, and restored the training of youth. He abolished the ephors and introduced the patronomoi (board of six elders). His early attempts to weaken the Achaean League (from 229) were successful, but in 222 his army fell at Sellasia to a Macedonian force summoned by the league. He fled to Egypt, where he was imprisoned but escaped (219); having failed to stir up revolt in Alexandria, he committed suicide.

Cleon (d. 422 bc, Amphipolis, Macedonia) Athenian politician. The first prominent representative of the merchant class in Athenian politics, he became leader of Athens in 429 bc after the death of his enemy Pericles. Advocating an offensive strategy in the Peloponnesian War, he proposed that all citizens of the rebellious Mytilene be put to death and its women and children enslaved; the measure passed but was reversed the next day. He reached the summit of his fame when he captured the Spartan island of Sphacteria, but he was killed by the Spartans while trying to retake Thrace.

Cleopatra in full Cleopatra VII Thea Philopator (b. 69 — d. Aug. 30, 30 bc, Alexandria) Egyptian queen (of Macedonian descent), last ruler of the Ptolemaic dynasty in Egypt. Daughter of Ptolemy XII (b.

112? — d. 51 bc), she ruled with her two brother-husbands, Ptolemy XIII (r. 51^17) and Ptolemy XIV (r.

47^44), both of whom she had killed, and with her son, Ptolemy XV, or Caesarion (r. 44-30). She claimed the latter was fathered by Julius Caesar, who had become her lover after entering Egypt in 48 bc in pursuit of Pompey. She was with Caesar in Rome when he was assassinated (44), after which she returned to Egypt to install her son on the throne.

She lured Mark Antony, Caesar’s heir apparent, into marriage (36), inviting the wrath of Octavian (later Augustus), whose sister Antony had earlier wed. She schemed against and antagonized Antony’s friend Herod the Great, thereby losing his support. At a magnificent celebration in Alexandria after Antony’s Parthian campaign (36-34), he bestowed Roman lands on his foreign wife and family. Octavian declared war on Cleopatra and Antony and defeated their joint forces at the Battle of Actium (31). Antony committed suicide and, after a failed attempt to beguile Octavian, so, too, did Cleopatra, possibly by means of an asp.

Cleophrades Ude-'a-fro-.dezV Painter or Kleophrades Painter

(fl. late 6th-early 5th century bc, Greece) Greek vase painter. Of unknown identity, he takes his name from that of the potter who signed one of his principal works; he may have been a pupil of Euthymides. He decorated large vases with popular scenes, such as athletic contests and mythological epics, mostly in the red-figure style (see red-figure pottery). Over 100 vessels have been attributed to him.

clepsydra See water clock

clerestory \'klir-,stor-e\ Windowed wall of a room that rises higher than the surrounding roofs to light the interior space. In large buildings, where internal walls are far from the outermost walls, the clerestory provides daylight to spaces that otherwise would be dark and windowless. This device was used in Byzantine and early Christian architecture and most highly developed in Romanesque and Gothic cathedrals. As the nave rose much higher than the roofs of the side aisles, its walls could be pierced by a row of windows near the ceiling.

Clergy, Civil Constitution of the See Civil Constitution of the Clergy

Clergy Reserves Lands set aside for the Church of England in Canada. Established by the Constitutional Act of 1791 “for the support and maintenance of a Protestant clergy,” they amounted to one-seventh of all land

Cleopatra, detail of a bas relief, c. 69-30 bc; in the Temple of Hathor, Dandarah, Egypt.

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grants. They became controversial after 1815, as some denominations demanded equal reserves and others argued that the lands should serve general public purposes independent of religion. An imperial act of 1827 allowed for the sale of one-fourth of the reserved land; in 1840 another imperial act forbade the creation of any new reserves. The reserves were finally secularized in 1854.

Clermont \kler-'mo n \. Council of (1095) Assembly for church reform called by Pope Urban II. When the Byzantine emperor Alexius I Comnenus requested aid against the Muslim Turks, the council became the occasion for launching the First Crusade. Urban thus launched a movement that

caught the popular imagination with the idea of retaking Jerusalem.

cleruchy \'klir-9-ke\ In ancient Greece, a body of Athenian citizens in a dependent country holding grants of land awarded by Athens. Athens used the cleruchy to cripple dependent states; plantations took the best land, and the colonizers formed military garrisons. Salamis, captured in the 6th century bc, may have held the earliest cleruchy. Under the Delian League and the Second Athenian League (5th– 4th century bc), the cleruchy was a regular instrument of Athenian imperialism. The financial advantage of being a cleruch encouraged many citizens to leave Athens, relieving population pressures.

Cleveland City (pop., 2000: 478,403), northeastern Ohio, U.S. Located on the southern shore of Lake Erie, it is Ohio’s second largest city. Initially the site of French and Indian trading posts, it took its name from Moses Cleaveland, who surveyed the area in 1796. It expanded following the opening of the Erie Canal and the arrival of the railroad in 1851. The American Civil War provided the stimulus for iron and steel processing and oil refining (John D. Rockefeller founded Standard Oil there), and heavy industry is still basic to its economy. More than 400 medical and industrial research centres and numerous educational institutions are in the area. The Rock and Roll Hall of Fame and Museum, designed by I.M. Pei, opened in 1995.

Cleveland, (Stephen) Grover (b. March 18, 1837, Caldwell, N.J., U.S. — d. June 24, 1908, Princeton)

22nd and 24th president of the U.S.

(1885-89, 1893-97). From 1859 he practiced law in Buffalo, N.Y., where he entered Democratic Party politics.

As mayor of Buffalo (1881-82), he was known as a foe of corruption. As governor of New York (1883-85), his independence earned him the hostility of Tammany Hall. Elected president in 1884, he supported civil-service reform and opposed high tariffs. Although he was narrowly defeated by Benjamin Harrison in 1888, he was reelected by a huge popular plurality in 1892. In 1893 he strongly urged Congress to repeal the Sherman Silver Purchase Act of 1890, which he blamed for the country’s severe economic depression.

Despite the repeal of the act, the

depression continued, resulting in the Pullman Strike in 1894. An isolationist, Cleveland opposed territorial expansion. In 1895 he invoked the Monroe Doctrine in the border dispute between Britain and Venezuela. By 1 896 supporters of the Free Silver Movement controlled the Democratic Party, which nominated William Jennings Bryan instead of Cleveland for presi-

dent. He retired to New Jersey, where he lectured at Princeton University.

Grover Cleveland

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Cliburn Vkll-.bornV Van orig. Harvey Lavan Cliburn, Jr. (b. July 12, 1934, Shreveport, La., U.S.) U.S. pianist. He was taught piano by his mother in his early years. After study with Rosina Lhevinne (1880-1976) at the Juilliard School, he made his debut with the New York Philharmonic. In 1958 he became a national sensation as the first American to win the Tchaikovsky Competition in Moscow. In 1962 he established the Van Cliburn International Piano Competition in Fort Worth, Texas. Possessed of an impressive technique, he limited himself to the Romantic repertoire and spent many years away from the concert stage.

click In phonetics, a suction sound made in the mouth. Click sounds occur in various African languages and are often used as interjections in other languages — for example, the sound of disapproval represented in

English by tsk, tsk. Clicks are a regular part of the consonant system in the Khoisan languages and in Bantu languages such as Xhosa and Zulu that have been strongly influenced by Khoisan.

client-centered therapy See nondirective psychotherapy

client-server architecture Architecture of a computer network in which many clients (remote processors) request and receive service from a centralized server (host computer). Client computers provide an interface to allow a computer user to request services of the server and to display the results the server returns. Servers wait for requests to arrive from clients and then respond to them. Ideally, a server provides a standardized transparent interface to clients so that clients need not be aware of the specifics of the system (i.e., the hardware and software) that is providing the service. Today clients are often situated at workstations or on personal computers, while servers are located elsewhere on the network, usually on more powerful machines. This computing model is especially effective when clients and the server each have distinct tasks that they routinely perform. In hospital data processing, for example, a client computer can be running an application program for entering patient information while the server computer is running another program that manages the database in which the information is permanently stored. Many clients can access the server’s information simultaneously, and, at the same time, a client computer can perform other tasks, such as sending e-mail. Because both client and server computers are considered intelligent devices, the client-server model is completely different from the old “mainframe” model, which utilized a centralized mainframe computer that performed all the tasks for its associated “dumb” terminals.

cliff dwelling Prehistoric, usually multistoried house of the ancestors of present-day Pueblo Indians, built from c. 1000 along the sides or under the overhangs of cliffs. The use of hand-hewn stone building blocks and adobe mortar in these communal dwellings was unexcelled even in later times. Rooms on upper levels could be entered either by doorways from

adjoining rooms or by ladders through holes in the ceilings; ground-floor rooms could be entered only through the ceiling. It is thought that the cliff dwellings were built as a defense against invading Navajo and Apache tribes. They were deserted by the inhabitants around the end of the 13th century. Many ruins remain, including notable ones at Canyon de Chelly National Monument, Mesa Verde National Park, and Montezuma Castle National Monument.

Clift, (Edward) Montgomery (b. Oct. 17, 1920, Omaha, Neb., U.S. — d. July 23, 1966, New York, N.Y.) U.S. actor. He acted on Broadway and was a founding member of the Actors Studio (1947). He made his film debut in The Search (1948) and became a star with Red River (1948). Noted for his serious, sensitive roles, he portrayed troubled heroes in films such as A Place in the Sun (1951), From Here to Eternity (1953), The Young Lions (1958), Judgment at Nuremberg (1961), and Freud (1962). Scarred by a car crash in 1956, he became addicted to drugs and alcohol and died of a heart attack at 45.

climate Condition of the atmosphere at a particular location over a long period of time (from one month to many millions of years, but generally 30 years). Climate is the sum of atmospheric elements (and their variations): solar radiation, temperature, humidity, clouds and precipitation (type, frequency, and amount), atmospheric pressure, and wind (speed and direction). To the nonspecialist, climate means expected or habitual weather at a particular place and time of year. To the specialist, climate also denotes the degree of variability of weather, and it includes not only the atmosphere but also the hydrosphere, lithosphere, biosphere, and such extraterrestrial factors as the sun. See also urban climate.

climatic adaptation In physical anthropology, the genetic adaptation of human beings to different environmental conditions, such as extreme cold, humid heat, desert habitat, and high altitudes. Extreme cold favours short, round bodies with short arms and legs, flat faces with fat pads over the sinuses, narrow noses, and a heavy layer of body fat. These adaptations provide minimum surface area in relation to body mass for minimum heat loss and protect the lungs and base of the brain against cold air in the nasal passages. In conditions of humid heat, where body heat must be dissipated, selection favours tall and thin bodies with maximum surface area for heat radiation. A wide nose prevents warming of the air in the nasal passages, and dark skin protects against harmful solar radiation. The desert-adapted person must compensate for water loss through sweating. A thin but not tall body minimizes both water needs and water loss; skin pigmentation is moderate, since extreme pigmentation is good

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protection from the sun but allows absorption of heat from direct sunlight, which must be lost by sweating. Adaptation to night cold, often part of a desert environment, provides increased metabolic activity to warm the body during sleep. High altitudes demand, in addition to cold adaptation, adaptation for low air pressure and the consequent low oxygen,

usually by an increase in lung tissue. See also acclimatization; race.

climatology Branch of atmospheric science concerned with describing climate and analyzing the causes and practical consequences of climatic differences and changes. Climatology treats the same atmospheric processes as meteorology, but it also seeks to identify slower-acting influences and longer-term changes, including the circulation of the oceans, the concentrations of atmospheric gases, and the small but measurable variations in the intensity of solar radiation.

Cline, Patsy orig. Virginia Patterson Hensley (b. Sept. 8, 1932, Winchester, Va., U.S. — d. March 5, 1963, near Camden, Tenn.) U.S. singer. Cline sang with country music groups as a teenager. She began recording in the mid-1950s and won first place on Arthur Godfrey's television show with "Walking After Midnight" (1957), a hit that made her the first female country singer to cross over into pop music. In 1960 she joined the Grand Ole Opry. After recovering from injuries sustained in a car crash, she returned in 1962 with hits such as "I Fall to Pieces" and "Crazy." She was killed in an airplane crash.

clinical psychology Branch of psychology concerned with the diagnosis and treatment of mental disorders. Clinical psychologists evaluate patients through interviews, observation, and psychological tests, and they apply current research findings and methodologies in making diagnoses and assigning treatments. Most clinical psychologists hold an academic degree (Ph.D. or Psy.D.) rather than a medical degree (M.D.); they may provide psychotherapy but cannot prescribe medications. Most practictioners work in hospitals or clinics or in private practice, often in tandem with psychiatrists and social workers, treating mentally or physically disabled patients, prison inmates, drug and alcohol abusers, and geriatric patients, among others. See also psychiatry; social work.

Clinton, Bill in full William Jefferson Clinton orig. William Jefferson Blythe III (b. Aug. 19, 1946, Hope, Ark., U.S.) 42nd president of the U.S. (1993-2001). Born shortly after his father's death in a car crash, he later took the last name of his mother's second husband, Roger Clinton. He attended Georgetown University, the University of Oxford (as a Rhodes Scholar), and Yale Law School, then taught law at the University of Arkansas. He served as state attorney general (1977-79) and served several terms as governor (1979-81, 1983-92), during which he reformed Arkansas's educational system and encouraged the growth of industry through favourable tax policies. In 1992 he won the Democratic Party's presidential nomination despite charges of personal impropriety; in the subsequent election he defeated the incumbent. Republican George Bush, and independent candidate H. Ross Perot. As president, Clinton obtained Senate ratification of the NAFTA accord in 1993. Along with his wife, Hillary Rodham Clinton, he devised a plan to overhaul the U.S. health care system, but it was rejected by Congress. He committed U.S. forces to a peacekeeping initiative in Bosnia and Herzegovina. In 1994 the Democrats lost control of Congress for the first time since 1954. Clinton responded by offering a deficit-reduction plan while opposing efforts to slow government spending on social programs. He defeated Robert Dole to win reelection in 1996. In 1997 he helped broker a peace agreement in Northern Ireland. He faced renewed charges of personal impropriety, this time involving his relationship with a White House intern, Monica Lewinsky; he denied the charges before a grand jury but ultimately acknowledged "improper relations" in a televised address. In 1998 Clinton became only the second president in history to be impeached. Charged

with perjury and obstruction of justice, he was acquitted by the Senate in 1999. His two terms saw sustained economic growth and successive budget surpluses, the first in three decades.

Clinton, DeWitt (b. March 2, 1769, Little Britain, N.Y. — d. Feb. 11, 1828, Albany, N.Y., U.S.) U.S. politician. A nephew of George Clinton, he practiced law and served as state senator (1798-1802, 1806-11), U.S. senator (1802-03), mayor of New York City (1803-15 except for two annual terms), lieutenant governor (1811-13), and governor (1817-23, 1825-28). He proposed the idea of a canal across New York state, and he oversaw the construction of Erie Canal from 1816 until its opening in 1825. The canal assured the 19th-century development of New York City as the major port of trade with the Midwest.

Clinton, George (b. July 26, 1739, Little Britain, N.Y. — d. April 20, 1812, Washington, D.C., U.S.) U.S. politician, fourth vice president of the U.S. (1805-12). A veteran of the French and Indian War, he was a leading member of the New York assembly (1768-75) and a delegate to the Continental Congress (1775). As governor of New York (1777-95, 1801-04), he was a forceful leader and able administrator; he led the opposition to the state's adoption of the U.S. Constitution. A supporter of Thomas Jefferson, he was twice elected vice president (with Jefferson and James Madison); he died in office.

Clinton, Hillary Rodham orig. Hillary Diane Rodham (b. Oct. 26, 1947, Chicago, HI., U.S.) U.S. lawyer, first lady, and politician. She attended Wellesley College and Yale Law School, from which she graduated first in her class. Her early professional interests focused on family law and children's rights. In 1975 she married her Yale classmate Bill Clinton, and she became first lady of Arkansas on his election as governor in 1979. She was twice named one of America's 100 most influential lawyers by the National Law Journal. When her husband became president (1993), she wielded power and influence almost unprecedented for a first lady. As head of the Task Force on National Health Care Reform, she proposed the first national health-care program in the U.S. but saw the initiative defeated. In 2000 she was elected to the U.S. Senate from New York, thereby becoming the first wife of a president to win elective office.

Clinton, Sir Henry (b. April 16?, 1730? — d. Dec. 23, 1795, Cornwall, Eng.) British commander in chief during the American Revolution. Commissioned in the British army in 1751, he went to North America in 1775 as second in command to William Howe. He commanded British troops to victories in New York and then succeeded to the supreme command on Howe's retirement in 1778. He led an offensive in the Carolinas in 1780 and effected the fall of Charleston. On his return to New York, he left Charles Cornwallis in charge of subsequent operations, which ultimately resulted in the British surrender after the Siege of Yorktown. He resigned in 1781 and returned to England, where he found himself blamed for the Yorktown defeat.

cliometrics \ 1 klI-o- , me-triks\ Application of economic theory and statistical analysis to the study of history, developed by Robert W. Fogel (b. 1926) and Douglass C. North (b. 1920), who were awarded the Nobel Prize for Economics in 1993 for their work. In Time on the Cross (1974), Fogel used statistical analysis to examine the relationship between the politics of American slavery and its profitability. North studied the link

between a market economy and legal and social institutions such as property rights in such works as Structure and Change in Economic History (1981). See also econometrics.

clipper ship Classic sailing ship of beauty, grace, and speed. Apparently originating with the small, swift coastal packet known as the Baltimore clipper, the true clipper evolved first in the U.S. (c. 1833) and later in Britain. It was a long, slim, graceful vessel with a projecting bow, a streamlined hull, and an exceptionally large spread of sail on three tall masts. Clippers carried tea from China and goldminers to California. Famous clippers included the American Flying Cloud and the British Cutty Sark. Though much faster than the early steamships (already in use when the clipper appeared), they were eventually outrun by improved steamship models and largely disappeared from commercial use in the 1870s.

Clitias See Cleitias

ditoridectomy or female circumcision or female genital mutilation Ritual surgical procedure ranging from drawing blood, to removing the clitoris alone, to infibulation or Pharaonic circumcision — removing the external genitals, joining the sides and leaving a small opening. Now often illegal, it dates to ancient times and purports to guard virginity and reduce sexual desire in traditional societies in many parts of the less-developed world. Infibulation, especially common in Sudan, Somalia, and Nigeria, is usually done by a midwife, often in unhygienic conditions. It may lead to severe bleeding, infection, exquisite pain, and

the 19th century, renowned for its

The clipper Flying Cloud

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death; if not, urination and sexual intercourse can be painful and menstrual blood may be retained. Women are reinfibulated after childbirth.

Clitunno River \kle-'tun-no\ ancient Clitumnus. River, central Italy.

It flows 37 mi (60 km) northwest to join a tributary of the Tiber River. A nearby spring was described by Virgil and Pliny the Younger and visited by the emperors Caligula and Flavius Honorius.

Clive (of Plassey), Robert, 1 st Baron (b. Sept. 29, 1725, Styche, Shropshire, Eng. — d. Nov. 22, 1774, London) British soldier and colonial administrator. In 1743 he was sent to Madras (Chennai) for the East India Company, where hostilities between it and the French East India Company allowed him to demonstrate his military skills. He made a fortune and returned to England in 1753 but was sent back to India in 1755. In 1757 his victory over the nawab of Bengal at the Battle of Plassey made him the virtual master of Bengal. His first government, though tainted by corruption and duplicity, was a model of generalship and statecraft. Back in England, he was elected to Parliament (1760) but failed to become a national statesman. He returned to India as governor and commander in chief of Bengal (1765-67). His reorganizing of the colony, including his fight against corruption, helped establish Britain’s power in India. He himself was attacked by Parliament on charges of corruption; though exonerated, he later committed suicide.

cloaca \klo-'a-k3\ In vertebrates, common chamber and outlet into which the intestinal, urinary, and genital tracts open. It is present in amphibians, reptiles, birds, some fishes (e.g., sharks), and monotreme mammals but is absent in placental mammals and most bony fishes. Certain animals (e.g., many reptiles and some birds, including ducks) have an accessory organ (penis) within the cloaca that is used to direct the sperm into the female’s cloaca. Most birds mate by joining their cloacas in a “cloacal kiss”; muscular contractions transfer the sperm from the male to the female.

dock Machine or electronic device that measures and records time. Both simple and elaborate clocks, as well as sundials, candle clocks, and sandglasses, were used for measuring time in ancient Egypt, Greece, and Rome. The first mechanical clocks were weight-driven and perhaps were invented for use in monasteries, where the disciplined life required a strict rendering of time. The first European public clock that struck the hours was erected in Milan in 1335, and the oldest surviving clocks are in England (1386) and France (1389). The first domestic clocks appeared late in the 14th century. About 1500 Peter Henlein, a German locksmith,

A classic pendulum clock. The power to run the clock comes from a slowly falling weight (other mechanical clocks utilize a spring). The escapement prevents the weight from falling all at once, and the swinging pendulum regulates the rate at which the escapement allows the clock's wheels (gears) to turn. The time required for a complete swing (period) of the pendulum depends only on the pendulum's length: a 39-in. (990-mm) pendulum has a period of one second.

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began to make the first portable timepieces, small clocks driven by a spring. Christiaan Huygens invented pendulum clocks in 1656. Big Ben, the great clock at Westminster in London, was installed in 1859 and is the standard for all accurate tower pendulum clocks. The most accurate mechanical timekeepers (within a few thousandths of a second per day) are clocks with short pendulums (about 39 in. [or 990 mm]). In 1929 the vibration of a quartz crystal was first applied to timekeeping; the maxi-

mum error of an observatory quartz-crystal clock is only a few ten-thousandths of a second per day. The first atomic clock went into operation in 1951. Atomic clocks, regulated by the natural periodic behaviour of a system of atoms (such as vibrations or emission of radiation), can have accuracies exceeding one billionth of a second per day, making them the most accurate clocks yet invented.

Clodion \klod-'yo n \ orig. Claude Michel (b. Dec. 20, 1738, Nancy, Fr.— d. March 29, 1814, Paris)

French sculptor. In 1755 he entered his uncle’s workshop in Paris, and later he became a student of Jean-Baptiste Pigalle. In 1759 he won the grand prize at the Royal Academy and embarked on a successful career, first in Rome and then in Paris, where he exhibited regularly at the Salon. He excelled at small statuettes and terra-cotta figures of nymphs, satyrs, and groups. After the French Revolution he changed his style to suit the Neoclassical taste for monumentality; he worked on the Arc de Triomphe du Carrousel (1805-06) and the Vendome Column (1806-09).

Clodius Pulcher Vklo-de-os-'pol-kor\, Publius (b. c. 92 — d. January,

52 bc, Bovillae, Latium) Roman politician. While fighting against Mithradates, he stirred up mutiny among the troops (68-67). In 62 he was accused of disguising himself as a female harpist to infiltrate a women’s festival at Julius Caesar’s house.

Though Cicero gave damaging evidence against him, he was acquitted, but Caesar divorced his wife because she was alleged to have admitted Clodius to the ceremony. As tribune (58), Clodius passed laws to punish Cicero for executing without trial those implicated in Catiline’s conspiracy, and Clodius had Cicero outlawed. Clodius’ s political partisans engaged in street fighting that disrupted Roman elections for several years. He was killed by another faction in a running brawl on the Appian Way.

cloisonne \,kl6i-z3-'na\ Enameling technique. Delicate strips of gold, brass, silver, copper, or other metal wire are welded to a metal plate in the shape of a design, and the resulting cellular spaces are filled with vitreous enamel paste that is fired, ground smooth, and polished. The earliest surviving examples are six 13th-century bc Mycenaean rings.

The technique reached its peak in the West during the Byzantine Empire.

Chinese cloisonne was widely produced during the Ming and Qing dynasties; in Japan it was popular in the Edo and Meiji periods. See also ENAMELWORK.

cloister Four-sided enclosure surrounded by covered walkways and usually attached to a monastic or cathedral church; also, the walkways themselves. The earliest cloisters were open arcades, usually with

sloping wooden roofs. This form was Qpen arcaded doister of Saint . generally superseded in England by TrophTnle AdeS; Fr . a range of windows lighting a jeanroubier vaulted ambulatory (aisle). In south-

"Female Satyr Carrying Two Putti," terra-cotta statuette by Clodion; in the Walters Art Gallery, Baltimore

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era climates, the open-arcaded cloister remained standard. An especially fine example is Donato Bramante's two-story open arcade at Santa Maria della Pace, Rome (1500^4).

clone Population of genetically identical cells or organisms that originated from a single cell or organism by nonsexual methods. Cloning is fundamental to most living things, since the body cells of plants and animals are clones that come ultimately from a single fertilized egg. More narrowly, the term refers to an individual organism grown from a single body cell of its parent that is genetically identical to the parent. Cloning has been commonplace in horticulture since ancient times; many varieties of plants are cloned simply by obtaining cuttings of their leaves, stems, or roots and replanting them. The body cells of adult humans and other animals are routinely cultured as clones in the laboratory. Entire frogs and mice have been successfully cloned from embryonic cells. British researchers led by Ian Wilmut achieved the first success in cloning an adult mammal in 1996. Having already produced clones from sheep embryos, they were able to produce a lamb (Dolly) using DNA from an adult sheep. The practical applications of cloning are economically promising but philosophically unsettling.

Close, Chuck (b. July 5, 1940, Monroe, Wash., U.S.) U.S. artist. After

early Abstract Expressionist experiments, in his first solo exhibition Close showed a series of enormous black-and-white portraits that he had pains-takingly transformed from small photographs to colossal. Photorealist paintings. Throughout his career, he concentrated on portraits — from the neck up — based on photographs he had taken. In addition to self-portraits, the paintings were usually of friends, many of whom were prominent in the art world. He experimented with a variety of media and techniques, including using fingerprints and colourful tiles that, seen from a distance, combined into an illusionistic whole. In 1988 a spinal blood clot left Close almost completely paralyzed and confined to a wheelchair. A brush-holding device strapped to his wrist and forearm, however, allowed him to continue working.

Close \'klos\, Glenn (b. March 19, 1947, Greenwich, Conn., U.S.) U.S. actress. She made her Broadway debut in 1974 and later starred in Bar-num (1980), The Real Thing (1984, Tony Award), and Death and the Maiden (1992, Tony Award). Her film debut in The World According to Garp (1982) was followed by roles in films such as The Natural (1984), Fatal Attraction (1987), and Dangerous Liaisons (1989). She also starred in the acclaimed television film Sarah, Plain and Tall (1991) and later returned to Broadway in Sunset Boulevard (1995, Tony Award).

closed-end trust See investment trust

closed shop Arrangement whereby a company employs only workers who are members in good standing of a specified labour union. It is the most rigid of the various schemes for protecting labour unions (more flexible arrangements include the union shop). Closed shops were declared illegal in the U.S. under the Taf- Hartley Act of 1947, but in practice they continue to exist in some industries, such as construction.

clostridium Mdas-'trid-e-oirA Any of the rod-shaped, usually gram-positive bacteria (see gram stain) that make up the genus Clostridium. They are found in soil, water, and the intestinal tracts of humans and other ani-mals. Some species grow only in the complete absence of oxygen. Dor-mant cells are highly resistant to heat, drying, toxic chemicals, and detergents. The toxins produced by C. botulinum, which causes botulism, are the strongest poisons known. The toxin of C. tetani causes tetanus; other species can cause gangrene.

Cloth of Gold, Field of See Field of Cloth of Gold

cloud Any visible mass of water droplets, ice crystals, or a mixture of the two that is suspended in the air, usually at a considerable height. Clouds are usually created and sustained by upward-moving air currents. Meteorologists classify clouds primarily by their appearance. The 10 main cloud families are divided into three groups on the basis of altitude. High clouds, which are found at mean heights of 45,000-16,500 ft (13-5 km), are, from highest to lowest, cirrus, cirrocumulus, and cirrostratus. Middle clouds, at 23,000-6,500 ft (7-2 km), are altocumulus, altostratus, and nimbostratus. Low clouds, at 6,500-0 ft (2-0 km), are stratocumulus, stratus, cumulus, and cumulonimbus. A shallow layer of cloud at or near ground level is called fog.

cloud chamber Radiation detector developed by C.T.R. Wilson. Its detecting medium is a supersaturated vapour (see saturation) that con-

denses around ions produced by the passage of energetic charged particles, such as alpha particles, beta particles, or protons. In a Wilson cloud chamber, supersaturation is caused by the cooling induced by a sudden expansion of the saturated vapour by the motion of a piston or an elastic membrane. In a diffusion chamber, the saturated vapour is cooled to supersaturation as it diffuses into a region kept cold by a coolant such as solid carbon dioxide or liquid helium.

Clouet \klu-'e\, Jean (b. c. 1485 — d. c. 1540, Paris, Fr.) French painter. He was chief painter to Francis I and produced many pastel portraits of members of the French court. Clouet was one of the best 16th-century portrait painters, both incisive and delicate in the psychological characterization of sitters. His drawings are simple, broad, and subtle; his paintings are fresh in colour, subdued in modeling, and minute in execution. He was celebrated in his lifetime as the equal of Michelangelo. His son Francois Clouet (c. 1515-72) took his place as official painter to Francis I in 1540.

clove Small, reddish brown flower bud of the tropical evergreen tree Syzygium aromaticum (sometimes called Eugenia caryophyllata), of the myrtle family. The tree is believed to be native to the Moluccas of Indonesia. Cloves were important in the earliest spice trade. With a strong aroma and hot and pungent taste, they are used to flavour many foods. Clove oil is sometimes used as a local anesthetic for toothaches. Eugenol, its principal ingredient, is used in germicides, perfumes, and mouthwashes, in the synthesis of vanillin, and as a sweetener or flavour intensifier.

clover Any legume of the genus Trifolium, composed of 300 or more annual and perennial species, found in most temperate and subtropical regions. The alternate, compound leaves usually have three toothed leaflets. The very small, fragrant flowers are crowded into dense heads. Clovers are highly palatable to livestock and high in protein, phosphorus, and calcium, thus providing valuable nourishment in the form of hay, pasture, and silage. They also improve and conserve soil by adding nitrogen and increasing the availability of other nutrients for crops that follow. The most important agricultural species are red clover (T. pratense), white clover (T. repens), and alsike clover (T. hybridum).

Clovis Vklo-vosX I German Chlodweg (b. c. 466 — d. Nov. 27, 511, Paris, Fr.) Merovingian founder of the Frankish kingdom. The son of Childeric I, king of the Salian Franks, Clovis was still a pagan when he conquered the last Roman ruler in Gaul at Soissons (486). He extended his rule as far south as Paris by 494. His wife, Clotilda, was a Catholic princess later recognized as a saint. She sought to convert Clovis to her faith. According to Gregory of Tours, during a faltering campaign against the Alamanni in 496, Clovis invoked his wife’s god and saw defeat turned to victory. He was baptized at Reims two years later, and he credited St. Martin of Tours for his victory over the Visigoths. Although he was the

first Germanic king to accept Catholic Christianity, Clovis expressed interest in Arian Christianity before converting to his wife’s religion. He promulgated the legal code known as the Lex Salica. He is traditionally regarded as the founder of the French monarchy and the original French champion of the Christian faith.

Clovis complex Widely distributed prehistoric culture of North America characterized by leaf-shaped flint projectile points with fluted sides. The complex also includes bone tools, hammerstones, scrapers, and unfluted points. It derives its name from the first site examined, in 1932, near Clovis, N.M. Clovis projectile points, dating from c. 10,000 bc, have been found in association with mammoth bones and indicate the existence of a big-game hunting tradition among the earliest settlers of North America. See also Folsom complex.

clown Comic character of mime and pantomime and the circus. The clown developed from the bald-headed, padded buffoons who performed in the farces and mimes of ancient Greece and from the professional comic actors of the Middle Ages. The Italian commedia dell' arte introduced the

Clover (Tri folium)

KEN BRATE- PHOTO RESEARCHERS

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harlequin, and the clown’s whiteface makeup was introduced with the 17th-century French character Pierrot. The distinctive clown costume of oversized shoes, hat, and giant ruff around the neck was established by the popular German clown character Pickelherring. The first circus clown, Joseph Grimaldi, appeared as “Joey” in England (1805) and specialized in pantomime, pratfalls, and slapstick. Famous 20th-century clowns included the Swiss pantomimist Grock (Adrian Wettach), the U.S. circus star Emmett Kelly, and the longtime star of the Moscow circus, Oleg Popov.

club moss Any of about 200 species of primitive vascular plants that constitute the genus Lycopodium (order Lycopodiales), mainly native to tropical mountains but also common in northern forests of both hemispheres. They are evergreen plants with needlelike leaves and, often, cone-like clusters of small leaves (strobili; see cone), each with a kidney-shaped spore capsule at its base. Representative species include running pine, or stag’s horn moss (L. clavcitum), ground cedar \(L. complanatum ‘flabelliforme’), shining club moss (L. lucidulum), fir club moss (L. selago), ground pine (L. obscurum), and alpine club moss (L. alpinum).

Cluj-Napoca Vkliizh-'na-po-kaV German Klausenburg Hungarian

Kolozsvar \'ko-lozh-,var\ City (pop., 2002: 702,755), northwestern Romania. Located in the Some§ul Mic River valley on the site of an ancient town, Cluj took shape in the 12th century, became a thriving commercial and cultural centre, and in 1405 was declared a free town. It became the capital of Transylvania in the 16th century. In 1920 Transylvania was incorporated into Romania. In the mid-1970s the city was joined with neighbouring Napoca. It is home to a university; its institute of speleology (the study of caves) was the first in the world.

Cluny Monastery founded in 910 by William the Pious, duke of Aquitaine. Established as a pious donation for the cure of the souls of the duke and his wife and family, the monastery at Cluny came to offer a more austere reading of the Benedictine Rule. It was dedicated to the apostles St. Peter and St. Paul, and in practice it came under the protection of the pope. William also established the independence of the monastery from all temporal rulers, religious or secular, and allowed the monks to elect the abbot. These liberties enabled the community to develop its emphasis on the liturgy and prayers for the dead, which inspired a reputation for holiness and attracted numerous benefactors. Cluniac monks were sent to reform monasteries throughout Europe and created a great web of related communities. Cluny’s influence on the church in the 1 1th— 12th century has been widely recognized, and its abbots were greatly esteemed. Its predominance was eroded by the rise of the Cistercian order, and in the later Middle Ages the monastery declined. It was suppressed during the French Revolution and closed in 1790. Its Romanesque Basilica of St. Peter and St. Paul (largely demolished in the 19th century) was the world’s largest church until the erection of Saint Peter's Basilica.

Clurman, Harold (Edgar) (b. Sept. 18, 1901, New York, N.Y., U.S. — d. Sept. 9, 1980, New York City) U.S. director and drama critic. He was an actor from 1924 and was a founding member of the experimental Group Theatre. He directed a wide range of Broadway plays, including Awake and Sing! (1935), Member of the Wedding (1950), Touch of the Poet (1957), and Incident at Vichy (1965), and he wrote drama reviews for The New Republic (1949-53) and The Nation (1953-80).

cluster of galaxies Gravitationally bound grouping of galaxies, numbering from the hundreds to the tens of thousands. Large clusters of galaxies often exhibit extensive X-ray emission from intergalactic gas heated to tens of millions of degrees. Also, interactions of galaxies with each other and with the intracluster gas may deplete galaxies of their own interstellar gas. The Milky Way Galaxy belongs to the Local Group, which lies on the outskirts of the Virgo Cluster.

clutch Device for quickly and easily connecting or disconnecting a pair of rotatable coaxial shafts. Clutches are usually placed between the driving motor and the input shaft to a machine and provide a convenient means for starting and stopping the machine and permitting the driving motor or engine to be started in an unloaded state (as in an automobile). Mechanical clutches provide either a positive (no-slip) or a friction-dependent drive; centrifugal clutches provide automatic engagement. An overrunning clutch transmits torque in one direction only and permits the driven shaft of a machine to freewheel (continue rotating after the driver stops); on bicycles, such clutches permit the rider to coast without moving the pedals.

Clutha River Vklti-thoN River, New Zealand. The longest river in South

Island, it rises in the Southern Alps and flows southeast 200 mi (320 km) to the sea. Its valley supports sheep, beef, grain, and fruit farming in the upper reaches and vegetable and dairy farming in the delta. The large Roxburgh hydroelectric station is located 45 mi (72 km) upstream.

Clyde, River River, southern Scotland. Scotland's most important river, it flows about 100 mi (160 km) from the Southern Uplands to the Atlantic Ocean. The upper Clyde is a clear fishing stream flowing north, but at Biggar it changes course and winds northwest to the Falls of Clyde. Beyond the falls, the widening Vale of Clyde, famous for the breeding of Clydesdale horses, is intensively cultivated. The Clydeside shipyards border the river for 20 mi (32 km) below Glasgow. At Dumbarton it reaches its estuary, the Firth of Clyde, which extends about 65 mi (105 km).

Clydesdale \ l klldz- l dal\ Breed of heavy draft horse that originated in Lanarkshire, Scotland, near the River Clyde. Though introduced to North America c. 1842, the Clydesdale never became a popular draft horse there. They average 17-18 hands (68-72 in., or 173-183 cm) in height and 2,000 lbs (900 kg) in weight. Their coloration is usually bay, dark brown, or black, with prominent white markings. They are noted for their high leg action while walking or trotting. The breed is characterized by feather (long hair) on the legs, an attractive head, and well-formed legs and feet.

cnidarian \nl-'dar-e-9n\ or coelenterate \si-Ten-t9-,rat\ Any of about 9,000 species of mostly marine aquatic invertebrates, constituting the phylum Cnidaria (or Coelenterata), that are unique in possessing specialized stinging cells (cnidocytes) borne on the tentacles. Cnidocytes contain fluid-filled capsules (nematocysts) with a harpoonlike coiled

Cnidarian body forms. A cnidarian may display either the sessile polyp form or the free-swimming medusa form; some pass through both forms during their life cycle. Both possess a hollow cavity with a single opening surrounded by tentacles. The polyp has a basal disc by which it attaches to the substrate; the mouth typically faces away from the substrate. In the medusa (jellyfish) form, the tentacles and mouth face downward. The outer cell layer (ectoderm) and inner cell layer (endoderm) are separated by the jellylike mesoglea. The mouth is also used to expel wastes. Digestion begins within the gastrovascular cavity and is completed by endoderm cells.

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thread used for stinging, paralyzing, and capturing prey. Cnidarians have no well-defined separate respiratory, circulatory, or excretory organs; their tissues, composed of two cell layers, surround a cavity known as a coelenteron (gas tro vascular cavity), which is the basic internal organ. Tentacles surrounding the mouth are used to capture and ingest food.

Cnidarians are carnivorous, feeding mostly on zooplankton but also on small crustaceans, fish eggs, worms, smaller cnidarians, and even small fish. Cnidarians range in size from nearly microscopic to more than 100 ft (30 m) long and more than a ton (910 kg) in weight. There are two basic body forms: the polyp (e.g., coral) and the medusa (e.g., jellyfish). See also hydra; Portuguese man-of-war; sea anemone.

Cnidus Vnl-dosN Ancient Greek coastal city, southwestern Anatolia. An important commercial centre and the home of a renowned medical school, Cnidus was one of six cities in the Dorian Hexapolis. It came under the control of the Persian Achaemenian dynasty after 546 bc. A democracy in the 4th century bc, it fell under Ptolemaic control in the 3rd century bc. A free city within the Roman province of Asia, it lasted until the 7th century ad, when it was abandoned. Excavation has revealed numerous public buildings, including the Temple of Aphrodite, where fragments of the celebrated statue of Aphrodite by Praxiteles were discovered.

CNN or Cable News Network Subsidiary company of Turner Broadcasting Systems. It was created by Ted Turner in 1980 to present 24-hour live news broadcasts, using satellites to transmit reports from news bureaus around the world. CNN became prominent in 1991 with its coverage of the Persian Gulf War. The company also operates the news channels Headline News and CNN International. See also cable television.

coach Four-wheeled, horse-drawn carriage with an enclosed body and an elevated seat in front for the driver. The coach originated in the 15th century in Hungary (where kocsi originally meant “wagon from the town of Kocs”). It was introduced in England in the mid- 16th century. Coaches were used as public conveyances with inside seats for passengers (as in the stagecoach) and for mail delivery. They were used mainly in European cities into the 18th century, when the private carriage became more common.

Coachella \k6-'chel-3\ Valley Valley, southern California, U.S. Part of the Colorado Desert, the 15-mi- (24-km-) wide valley stretches 45 mi (72 km) between the Little San Bernardino Mountains and the San Jacinto and Santa Rosa mountains. A productive agricultural region, it also has popular desert resorts, including Palm Springs.

coagulation Process of forming a blood clot to prevent blood loss from a ruptured vessel. A damaged blood vessel stimulates activation of clotting factors, eventually leading to the formation of long, sticky threads of fibrin. These make a mesh that traps platelets, blood cells, and plasma. This meshwork soon contracts into a resilient clot that can withstand the friction of blood flow. Under abnormal circumstances, clots can form in an intact vessel and may block it. See also anticoagulant.

Coahuila V.ko-a-'we-laX State (pop., 2000: 2,298,070), northeastern Mexico. It covers 57,908 sq mi (149,982 sq km), and its capital is Saltillo. Coahuila occupies a roughly broken plateau intersected by several mountain ranges. The first Spanish settlement in the region was at Saltillo in 1575. Coahuila and Texas formed a single state (1824-36) until Texas declared its independence. In 1857 Coahuila was combined with Nuevo Leon, and in 1868 it became a separate state. Its economy is based on livestock raising, agriculture, and mining; southern Coahuila has long been known for the wine and brandy it produces.

coal Solid, usually black but sometimes brown, carbon-rich material that occurs in stratified sedimentary deposits. One of the most important fos-

sil fuels, it is found in many parts of the world. Coal is formed by heat and pressure over millions of years on vegetation deposited in ancient shallow swamps (see peat). It varies in density, porosity, hardness, and reflectivity. The major types are lignite, subbituminous, bituminous, and anthracite. Coal has long been used as fuel, for power generation, for the production of COKE, and as a source of various compounds used in synthesizing dyes, solvents, and drugs. The search for alternative energy sources has periodically revived interest in the conversion of coal into liquid fuels; technologies for coal liquefaction have been known since early in the 20th century.

Coal Measures Major division of Upper Carboniferous (323-290 million years ago) rocks and time in Great Britain. The Coal Measures account for much of England’s coal production. The deposits consist largely of bituminous coal, though anthracite coals occur in southern Wales.

Though local variation in the coal seams occurs, great uniformity is evident on a regional scale, and some coal beds can be identified throughout Great Britain and even on the European continent.

coal mining Extraction of coal deposits from the Earth’s surface and from underground. Because coal was the basic energy source that fueled the Industrial Revolution, the resulting industrial growth supported the large-scale exploitation of coal deposits. In the late 20th century, open pit mines replaced underground mines as the principal source of coal in the industrial nations. The mining of coal from surface and underground deposits today is a highly productive, mechanized operation.

Coalsack Dark nebula in the Crux constellation (Southern Cross). It reduces the brightness of stars beyond it by 1—1.5 magnitudes. Easily visible against a starry background, it is probably about 550-600 light-years from Earth and 20-30 light-years in diameter. It figures in legends of peoples of the Southern Hemisphere and has been known to Europeans since c. 1500. The Northern Coalsack, in the constellation Cygnus, is similar in nature and appearance but somewhat less obvious.

coarctation of the aorta See coarctation of the aorta

Coase \'koz\, Ronald (Harry) (b. Dec. 29, 1910, Willesden, Middlesex, Eng.) British-U.S. economist. He received his doctorate from the London School of Economics and taught principally there and the University of Chicago. In his best-known paper, “The Problem of Social Cost” (1960), he challenged the classical logic of prohibiting behaviour that damages others. He argued that legal scholars should focus on the importance of an efficient marketplace and on negotiation rather than litigation. He was awarded the Nobel Prize in 1991.

coast or shore Broad area of land that borders the sea. The coastlines of the world’s continents measure about 193,000 mi (312,000 km). They have undergone shifts in position and changes in shape over geologic time because of substantial changes in the relative levels of land and sea. Other factors that alter coasts are erosion processes such as wave action and weathering, deposition of rock debris by currents, and tectonic activity. Coastal features result largely from the interaction and relative intensity of these processes, though the type and structure of the underlying rocks also play a part.

coast guard Naval force that polices compliance with a nation's maritime laws and assists vessels wrecked or in distress on or near its coasts. First established in the early 19th century to discourage smuggling, coast guards may maintain lighthouses, buoys, and other navigational aids and provide emergency aid to merchant sailors and to victims of natural disasters. Duties may include icebreaking in inland waterways and the collection and broadcasting of meteorological data concerning floods and storms. In several European countries, volunteer lifeboat associations handle coast-guard duties.

Coast Ranges or Pacific Coast Ranges Series of ranges, along the Pacific coast of North America. They run from southern California through Oregon and into west-central Washington. The ranges' average elevation is about 3,300 ft (1,000 m) above sea level, but some peaks and ridges rise to more than 6,600 ft (2,000 m). Giant redwoods dominate the forests along the coasts of southern Oregon and northern California. The Coast Mountains of British Columbia are not a continuation of the U.S. Coast Ranges but of the Cascade Range.

coat of arms or shield of arms Heraldic device dating to the 12th century in Europe. It was originally a cloth tunic worn over or in place of armour to establish identity in battle. In the full armorial achievement the distinctively patterned shield is ornamented with a crest, helmet, mantling, motto, crown, wreath, and supporters and rests upon a compartment. Arms were later adopted as emblems for schools, churches, guilds, and corporations to reflect their origins or histories. See also heraldry.

coati \k9-'wa-t3, kwa-'te\ or coati mu ndi Any of three species (genus Nasua, family Procyonidae) of raccoonlike omnivores, found in

Coati (Nasua nasua)

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wooded regions from the southwestern U.S. through South America. The coati has a long, flexible snout and a slender, darkly banded tail that it

often carries erect. The male measures 29-54 in. (73-136 cm) in length (half of which is tail) and weighs 10-24 lbs (4.5-11 kg). Females and young commonly live in bands of five to 40; males are solitary, joining bands only during mating season. Coatis feed by day on seeds, fruits, eggs, and small animals.

coaxial cable or coax Self-shielded cable used for transmission of communications signals, such as those for television, telephone, or computer networks. A coaxial cable consists of two conductors laid concentrically along the same axis. One conducting wire is surrounded by a dielectric insulator, which is in turn surrounded by the other, outer conductor, producing an electrically shielded transmission circuit. The whole cable is wrapped in a protective plastic sheathing. The signal propagates within the dielectric insulator, while the associated current flow is restricted to adjacent surfaces of the inner and outer conductors. As a result, coaxial cable has very low radiation losses and low susceptibility to external interference.

Cobain, Kurt (b. Feb. 20, 1967, Aberdeen, Wash., U.S. — d. April 5, 1994, Seattle, Wash.) U.S. rock musician. He formed the rock trio Nirvana in Aberdeen in 1986. The band, whose style derived from punk rock, combined the fury of that genre with anguished lyrics, a style that, together with their tom jeans and flannel shirts, became known as grunge rock. Their first album, Bleach (1989), was followed by Nevermind (1991), featuring the hit “Smells Like Teen Spirit”; it was the first punk-oriented album to achieve popularity with a mainstream audience. Cobain was elevated to prominence, but with the album In Utero (1993) he railed against his fame. Known for his self-destructive behaviour and heroin use, he shot and killed himself in his home.

cobalt Metallic chemical element, one of the transition elements, chemical symbol Co, atomic number 27. Widely dispersed in small amounts in many minerals and ores, this magnetic, silvery white metal with a faint bluish tinge is used mostly for special alloys (e.g., alnico, tool steel) with exacting applications. At valence 2 or 3 it forms numerous coordination complexes. One is vitamin B 12 (cyanocobalamin; see vitamin B complex). Cobalt and its compounds are used in electroplating and colouring ceramics and glass and as lamp filaments, catalysts, a trace element in fertilizers, and paint and varnish driers. The pigment cobalt blue has a variable composition, roughly that of cobalt oxide plus alumina. A radioactive isotope of cobalt emits penetrating gamma rays that are used in radiation therapy.

Cobb, Howell (b. Sept. 7, 1815, Jefferson county, Ga., U.S. — d. Oct. 9, 1868, New York, N.Y.) U.S. politician. He served in the U.S. House of Representatives (1843-51, 1855-57), where he promoted Southern interests by supporting the annexation of Texas and the Mexican War. Nevertheless, he also supported the Compromise of 1 850, which was favoured by the North. He served as governor of Georgia (1851-53). He supported the presidential candidacy of James Buchanan, who appointed him secretary of the treasury (1857-60). An opponent of Abraham Lincoln, he became a spokesman for secession. He served as chairman of the convention called to organize the Confederacy, then organized his own regiment and led it to the front in the American Civil War.

Cobb, Ty in full Tyrus Raymond Cobb (b. Dec. 18, 1886, Narrows, Ga., U.S. — d. July 17, 1961, Atlanta,

Ga.) U.S. baseball player, one of the

greatest offensive players and perhaps the fiercest competitor in baseball history. He joined the Detroit Tigers in 1905, batting left-handed but throwing right-handed. He spent 22 seasons as an outfielder with the Detroit Tigers, then managed them from 1921 to 1926. His record for career batting average (.366) remains unbroken; those for runs batted in (1,937), runs (2,245), and hits (4,189) stood for many years. He batted at least .300 for 23 straight seasons, an all-time record, and his three years of batting over .400 also represent a record. His career record of 892 stolen bases (partly the result

of the brutality with which he used his cleats) was surpassed only in 1979. In the first election to the Baseball Hall of Fame in 1936, Cobb received the most votes.

Cobbett, William (b. March 9, 1763, Farnham, Surrey, Eng. — d. June 18, 1835, London) English journalist. He joined the army and served in Canada (1785-91). He lived in the U.S. (1794-1800), where he launched his career as a journalist, fiercely attacking the spirit and practice of American democracy and winning himself the nickname “Peter Porcupine.” He returned to England and founded the weekly Political Register (1802), which he published until his death. He championed traditional rural values as England entered the Industrial Revolution; his reactionary views of the ideal society struck a powerful chord of nostalgia, and he also criticized corruption, harsh laws, and low wages.

Cobden, Richard (b. June 3, 1804, Dunford Farm, near Midhurst, Sussex, Eng. — d. April 2, 1865, London) British politician. He gained an independent fortune in the calico wholesale business. After travel to study trade policies in Europe and the U.S., he wrote pamphlets on international free trade. He was elected to Parliament (1841-57,

1859-65) and, with his close associate, John Bright, successfully fought to repeal the Corn Laws. In the 1850s he argued for friendly relations with Russia, even after the Crimean War had begun. He helped negotiate a commercial treaty with France (1860) that included a most-favoured-nation clause later duplicated in other treaties.

cobia Vko-b9-3\ Swift-moving, slim marine game fish (Rachycentron canadum), the only member of

the family Rachycentridae. Found in most warm oceans, this voracious predator may grow as long as 6 ft (1.8 m) and weigh 150 lbs (70 kg) or more. It has a jutting lower jaw, a rather flat head, and light-brown sides, each with two lengthwise, brown stripes. Its distinctive dorsal fin consists of a row of short spines followed by a long, soft-rayed fin.

Coblenz See Koblenz

COBOL Vko-.boL in full Common Business-Oriented Language. High-level computer programming language, one of the first widely used languages and for many years the most popular language in the business community. It developed from the 1959 Conference on Data Systems Languages, a joint initiative between the U.S. government and the private sector. COBOL was created to fulfill two major objectives: portability (ability of programs to be run with minimum modification on computers from different manufacturers) and readability (ease with which a program can be read like ordinary English). It ceased to be widely used in the 1990s.

cobra Any of several highly venomous elapid snakes that expand their neck ribs to form a hood. They are found in warm regions of Africa,

Australia, and Asia. Cobra bites are fatal in about 10% of human cases.

Cobras feed primarily on small vertebrates. The Indian cobra (Naja naja) kills several thousand people annually, mostly because it enters houses to catch rats. The king cobra {Ophiophagus hannah) is the world’s largest venomous snake, often more than 12 ft (3.5 m) long. Some African cobras can spit their venom more than 6 ft (1.8 m). Cobras are favourites of snake charmers, who, by their movements rather than their music, tease the deaf snakes into assuming the upreared defense posture.

Cobra Expressionist group of painters formed in Paris in 1948. The name derives from the first letters of the capitals of their native countries:

Ty Cobb.

PICTORIAL PARADE

Cobden, pencil sketch by V. Manzano; in the West Sussex Record Office (Cobden Papers 762)

COURTESY OF THE GOVERNORS OF DUNFORD AND THE COUNTY ARCHIVIST OF WEST SUSSEX

Black-necked cobra (Naja nigricollis)

E.S. ROSS

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Copenhagen, Brussels, and Amsterdam. The group, which disbanded in 1951, included Karel Appel, Pierre Alechinsky (b. 1927), Jean-Michel Atlan (1913-60), Guillaume Corneille (b. 1922), and Asger Jom (1914-73). Their work, influenced by poetry, film, folk art, and “primitive” art, featured brilliant colour and spontaneous brushwork akin to action painting; the human figure was a frequent motif.

Coburn, Alvin Langdon (b. June 11, 1882, Boston, Mass., U.S. — d. Nov. 23, 1966, Rhos-on-Sea, Denbighshire, Wales) U.S. -bom British photographer. He did not take up photography seriously until he met Edward Steichen in 1899. In 1902 he opened a studio in New York City and joined the Photo-Secession. In 1904 he went to London with a commission to photograph celebrities; his memorable portraits include those of Auguste Rodin, Henry James, and George Bernard Shaw posing as Rodin’s Thinker. In 1917, influenced by Cubism and Futurism, he produced the first photographs depicting abstract compositions.

coca Tropical shrub (Erythroxylum coca) of the family Erythroxylaceae. It is native to the eastern Andes Mountains but cultivated in Africa, northern South America, Southeast Asia, and Taiwan. Its leaves are the source of cocaine and several other alkaloids. Coca thrives best in hot, damp environments, such as forest clearings; but the leaves most preferred are obtained in drier localities, on the sides of hills. The composition of different specimens of coca leaves is highly variable. Good samples have a strong tealike odor and a pleasant, pungent taste. When chewed, coca leaves produce a sense of warmth in the mouth; because of their potent stimulant and appetite-depressant effects, coca has been used for centuries by South American peasants to ease the effects of punishing physical labor.

Coca-Cola Co. U.S. corporation known for manufacturing the syrup and concentrate for the soft drink Coca-Cola, the most popular branded drink in the world. Coca-Cola was invented as a tonic by an Atlanta, Ga., pharmacist, John S. Pemberton (1831-88); it included cocaine (removed in 1905) and caffeine-rich extracts of the kola nut. Another Atlanta pharmacist, Asa Griggs Candler (1851-1929), acquired the formula and in

1892 founded the Coca-Cola Co., which he built into a commercial empire. Candler saw the product as syrup to be combined with carbonated water at a soda fountain; he did not anticipate the success of the bottled product, and as a result bottling operations were run by franchisees. After World War II the company began to manufacture other beverages, and in the early 21st century its product line included root beer, bottled water, juices, and sports drinks. Its corporate headquarters are in Atlanta.

cocaine Heterocyclic compound (C 17 H 2 iN 0 4), an alkaloid obtained from coca leaves. It has legal uses in medicine and dentistry as a local anesthetic but far more is used illegally, usually as the hydrochloride. When sniffed in small amounts, cocaine produces feelings of well-being and euphoria, decreased appetite, relief from fatigue, and increased mental alertness. Larger amounts or prolonged use can damage the heart and nasal structures and cause seizures. In altered, more potent, cheaper forms (freebase, crack), cocaine is injected or smoked and is extremely addictive (see drug addiction) and detrimental to health. Prolonged or compulsive use of any form of purified cocaine can cause severe personality disturbances, inability to sleep, appetite loss, and paranoid psychosis.

coccus Vka-kos\ Spherical bacterium. Many species have characteristic arrangements that are useful in identification. Pairs of cocci are called diplococci; rows or chains, streptococci (see streptococcus); grapelike clusters, staphylococci (see staphylococcus); packets of eight or more cells, sarcinae; and groups of four cells in a square arrangement, tetrads. These characteristic groupings occur as a result of variations in the reproduction process.

Cochabamba \ l ko-cha-'bam-ba\ City (pop., 2001: 516,683), central Bolivia. Founded as Villa de Oropeza in 1574, it received city status in 1786 and was renamed Cochabamba (Khocha Pampa), a name in the Quechua language that means “plain full of small lakes.” A favourable climate and attractive setting have helped make it Bolivia’s third largest city. It is

the chief distribution point for eastern Bolivia. It is the site of the Major University of San Simon (1826), a cathedral, and a government palace.

Cochin Vko-.chinV China French Cochinchine \ko-she n -'shen\ Region, southern Vietnam. Covering 30,000 sq mi (77,700 sq km), the area was a vassal of the Chinese empire and later part of the Khmer kingdom of Cambodia. Its capital, Saigon (see Ho Chi Minh City), was occupied by the French in 1859. It was made a French colony in 1867 and combined with other French protectorates to form French Indochina in 1887. Incorporated into Vietnam in 1949, it was part of South Vietnam (1954-76) until the country was reunited. It includes the Mekong River delta, one of the greatest rice-producing regions in Asia.

Cochise \ko-'ches\ (d. June 8, 1874, Chiricahua Apache Reservation, Ariz.Terr., U.S.) Chiricahua Apache chief who led the resistance to white incursions into the American Southwest. Nothing is known of his birth or early life. His people remained at peace with white settlers through the 1850s, but in 1861 skirmishes and eventually all-out war broke out between the Apache and the U.S. Army. Cochise and his followers eluded capture for 10 years. By 1872, however, most Apache, including Cochise, had agreed to move onto reservations.

Cochran, Jacqueline (b. 1910?, Pensacola, Fla., U.S. — d. Aug. 9, 1980, Indio, Calif.) U.S. aviator. Orphaned early and reared in poverty, she had learned to fly by 1932, partly to promote the products of the cosmetics company she had founded. In 1938 she set a speed record for women flying across North America. In World War II she trained women transport pilots in the British and later the U.S. Air Force auxiliaries. In 1953 she broke the world speed record (for both men and women) in a jet, and in 1961 she became the first woman to fly at twice the speed of sound.

cockatiel Vka-ko-.telX Crested, small, gray Australian parrot (Nymphicus hollandicus). It has a yellow head, red ear patches, and a heavy beak used to crack nuts. The cockatiel is in the same family (Cacatuidae) as the larger cockatoo. About 13 in. (32 cm) long, the cockatiel lives in open areas and eats grass seeds. One of the most common pet parrots, it is bred in many colour variations.

cockatoo Any of 21 species of crested parrots (family Cacatuidae), found in Australia and from New Guinea to the Solomon Islands. Most species are white with touches of red or yellow; some are black. All have a massive beak used to crack nuts, dig up roots, or pry grubs from wood; feeding is aided by a worm-like tongue. Treetop, hole-nesting birds, cockatoos at times form large, noisy flocks that damage crops. The largest cockatoo (the palm, or great black, cockatoo) is about 25-30 in.

(65-75 cm) long. Some cockatoos live more than 50 years.

Cockburn, Sir Alexander (James Edmund), 10th Baronet (b. Dec. 24, 1802— d. Nov. 21,

1880, London, Eng.) British jurist. In his early career he earned a high reputation in trials and as a reporter of cases. He served in the House of Commons (1847-56), as attorney general (1851-56), and as chief justice of the Court of Common Pleas (1856-59) before being appointed to the Queen’s Bench (1859-74). He served on the panel that decided the Alabama claims and finally served as lord chief justice of England (1874-80). He is best known for his tests of obscenity (to be obscene, the material in question had to be proved to “deprave and corrupt” those exposed to it) and insanity (to be insane, a criminal defendant had to be proved unwitting of the “nature and quality” of his criminal act or incapable of recognizing it as wrong).

cockchafer Large European beetle (. Melolontha melolontha) that damages foliage, flowers, and fruit as an adult and plant roots as a larva. In Britain, the name refers more broadly to any of the beetles in this subfamily (Melolonthinae), which are known in North America as June beetles. See also chafer, scarab beetle.

cockfighting Contest in which gamecocks, often fitted with metal spurs, are pitted against each other. Fights are usually to the death. An

Coca (Erythroxylum coca).

W.H. HODGE

Sulfur-crested cockatoo (Cacatua galerita).

WARREN GARST/TOM STACK & ASSOCIATES

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ancient and widespread sport, cockfighting traditionally involves betting on single matches or a series of pairings. Though many countries have banned or restricted it, the laws are not always strictly enforced and illegal matches are often held privately.

cockle or heart clam Any of approximately 250 species (family Cardiidae) of marine bivalves distributed worldwide. They range in diameter from about 0.5 in. (1 cm) to about 6 in. (15 cm). The two valves of the shell are equal in size and shape and range in colour from brown to red or yellow. Most species live just below the low-tide line, though some have been obtained from depths of more than 1,500 ft (500 m) or in the intertidal zone. Many species are marketed commercially for their meat.

Cockpit Country Region, western central Jamaica. Covering some 500 sq mi (1,300 sq km), the area has typical karst topography, with conical hills rising above sinkholes with sharp, precipitous sides (called “cockpits”). This inhospitable terrain provided refuge for runaway slaves, who became guerrilla fighters when the English conquered Jamaica in 1665. Their descendants today number about 5,000 and still maintain some independence: all land belongs to the community, they pay no taxes, and the central government may interfere only in case of a capital crime.

cockroach or roach Any of more order Blattaria, order Dictyoptera) that are among the most primitive living, winged insects and among the oldest (more than 320 million years

old) fossil insects. Cockroaches have a flattened, oval body; long, thread-like antennae; and a shining, leathery, black or brown covering. They prefer a warm, humid, dark environment and are usually found in tropical or other mild climates, but have become widespread in heated buildings, especially city apartment buildings, in the temperate zone, and infestations can be severe. Only a few species have become pests. Cockroaches eat both animal and plant material. The American cockroach is up to about 2 in. (30-50 mm) long. The German cockroach (less than 0.5 in., or about 12 mm, long) is a common household pest which has been spread throughout the world by ship.

Coco River formerly Segovia River River, Central America. Rising in southern Honduras, it flows 485 mi (780 km) to enter the Caribbean Sea at Cape Gracias a Dios. In 1961 its middle and lower course was declared the international boundary between Honduras and Nicaragua. Only the lower 140 mi (225 km) are navigable.

coconut palm Tree (Cocos nucifera) of the palm family, one of the most important crops of the tropics. Its slender, leaning, ringed trunk rises from a swollen base and is topped by a graceful crown of giant, feathery leaves. The large ovoid or ellipsoid mature fruits have a thick, fibrous husk surrounding the familiar single-seeded nut. The nut contains a white and somewhat sweet meat, which is eaten raw; coconut oil is extracted from the meat. The nutritious liquid “milk” at the centre may be drunk directly from the nut. The husk provides coir, a fibre highly resistant to salt water that is used in the manufacture of ropes, mats, baskets, brushes, and brooms. The nutshells are used as containers and often decoratively carved.

Cocos Islands or Keeling Islands Territory (pop., 1996: 558) of Australia. Lying in the eastern Indian Ocean about 580 mi (930 km) southwest of Java, it consists of two isolated atolls and 27 small coral islets and has a total land area of 5.6 sq mi (14.4 sq km). They were discovered in 1609 by William Keeling and first settled in 1826. Declared a British possession in 1857, the Cocos at times came under the government of Ceylon but ultimately passed to Australia in 1955. In 1984 the residents voted to merge with Australia.

Cocteau \kok-'t6\, Jean (b. July 5, 1889, Maisons-Laffitte, near Paris, France — d. Oct. 11, 1963, Milly-la-Foret, near Paris) French poet, playwright, and film director. He published his first collection of poems, La Lampe d’Aladin, at age 19. He converted to Catholicism early but soon renounced religion. During World War I he was an ambulance driver on the Belgian front, the setting for the novel Thomas Timposteur (1923). In the years when he was addicted to opium, he produced some of his most important works, including the play Orphee

(1926) and the novel Les Enfants terribles (1929). His greatest play is thought to be The Infernal Machine (1934). His first film was The Blood of a Poet (1930); he returned to filmmaking in the 1940s, first as a screenwriter and then as a director, and made such admired films as Beauty and the Beast (1945), Orphee (1949), and Le Testament d' Orphee (1960). Musically, Cocteau was closely associated with the group of composers known as Les Six; among other collaborations, he provided ballet scenarios for Erik Satie {Parade, 1917) and Darius Milhaud {Le Boeuf sur le toit, 1920) and wrote librettos for Igor Stravinsky {Oedipus, 1927) and Milhaud {La Voix humaine, 1930). Also an artist, he illustrated numerous books with his vivid drawings, and he worked as a designer as well.

cod Large and economically important marine fish {Gadus morhua, family Gadidae) found on both sides of the North Atlantic, usually near the bottom in cold water. It ranges from inshore regions to deep waters. It is valued for its edible flesh, the oil of its liver, and other products. The cod is dark-spotted and ranges from greenish or grayish to brown or blackish; it may also be dull to bright red. It usually weighs up to about 25 lbs (11.5 kg) but can reach a maximum length and weight of more than 6 ft (1.8 m) and 200 lbs (91 kg). It feeds largely on other fishes and various invertebrates.

Cod, Cape See Cape Cod

Coddington, William (b. 1601, Boston, Lincolnshire, Eng. — d. Nov. 1, 1678, Rhode Island) American colonial governor and religious dissident. An official in the Massachusetts Bay Company, he immigrated to Massachusetts in 1630 and served in the colonial legislature. As a follower of Anne Hutchinson, he was obliged to leave the colony for Aquidneck Island (Rhode Island), where he established settlements at Portsmouth and Newport. Although he hoped to maintain Aquidneck as a separate colony, it was combined with Roger Williams's Providence plantation in 1644. Later acknowledging Rhode Island's unity, he served as its governor in 1674, 1675, and 1678.

code System of symbols and rules used for expressing information according to an unvarying rule for replacing a piece of information from one system, such as a letter, word, or phrase, with an arbitrarily selected equivalent in another system. Substitution ciphers are similar to codes except that the rule for replacing the information is known only to the transmitter and the intended recipient of the information. Binary code and other machine languages used in digital computers are examples of codes. Elaborate commercial codes were developed during the early 20th century (see Jean M.E. Baudot, Samuel F. B. Morse). In recent years more advanced codes have been developed to accommodate computer data and satellite communications. See also ASCII, cryptography.

code, law See law code

Code Napoleon See Napoleonic Code

codeine Heterocyclic compound, a naturally occurring alkaloid found in opium, used in medicine as a cough suppressant and analgesic drug. It

exerts its effects by acting on the central nervous system (brain and spinal cord). Chemically it is methylmorphine, the methyl ether of morphine, an alkaloid of the phenanthrene type; its action is weaker than that of moiphine, and it is less likely to lead to drug addiction.

codependency An extreme dependency by one person on another who is suffering from an addiction. Common characteristics include low self-esteem coupled with a high need for approval. Not a formal psychiatric

Great heart cockle (Dinocardium robustum)

HARRY ROGERS

than 3,500 insect species (in sub-

Female cockroach (Periplaneta)

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GISELE FREUND

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diagnosis, codependency is a psychological syndrome noted in relatives or partners of alcoholics or substance abusers.

codex Manuscript book, especially of Scripture, early literature, or ancient mythological or historical annals. The earliest type of manuscript in the form of a modem book (i.e., a collection of pages stitched together along one side), the codex replaced earlier rolls of papyrus and wax tablets. Among its advantages, it could be opened at once to any point in the text, it permitted writing on both sides of the leaf, and it could contain long texts. The oldest extant Greek codex is the Codex Sinaiticus (4th century ad), a biblical manuscript. Codices were developed separately by pre-Columbian Mesoamericans after c. ad 1000.

Codium Yko-de-smX Genus of marine green algae usually found in deep pools along rocky coasts. The threadlike branches are often woven together to form a velvety body sometimes longer than 12 in. (30 cm). In some species the body has visible branches; in others it folds in on itself like intestines. Codium is the favourite food of some sea slugs.

cod-liver oil Oil obtained primarily from the liver of the Atlantic cod and related fish. It is principally a mixture of the glycerides (see glycerol) of many fatty acids, but its minor constituents, the fat-soluble vitamin A and vitamin D, give it its importance. It was once used to treat and prevent rickets, but the widespread fortification of milk with vitamin D in the United States and Europe beginning in the 1930s eliminated rickets as a significant public health problem. It is still used as a remedy for joint pain caused by arthritis and as a preventive of cardiovascular disease, although these benefits have not been proven scientifically. It is also used in feeds for poultry and other animals.

Cody, William F(rederick) known as Buffalo Bill (b. Feb. 26, 1846, Scott county, Iowa, U.S. — d. Jan. 10, 1917, Denver, Colo.) U.S. buffalo hunter, army scout, and Indian fighter. He became a rider for the Pony Express and later served in the American Civil War. In 1 867-68 he hunted buffalo to feed construction crews for the Union Pacific Railroad; he became known as Buffalo Bill after slaughtering 4,280 head of buffalo in eight months. He was a scout for the U.S. 5th Cavalry (1868-72, 1876) as it subdued Indian resistance. His exploits, including the scalping of the Cheyenne warrior Yellow Hair in 1876, were chronicled by reporters and novelists, who made him a folk hero. He began acting in dramas about the West, and in 1883 he organized his first Wild West Show, which included stars such as Annie Oakley and Sitting Bull. The show toured in the U.S. and abroad to wide acclaim.

Coe, Sebastian (Newbold) (b. Sept. 29, 1956, London, Eng.) British runner. He won his first major race in 1977. He first ran against his rival Steve Ovett in 1978, and the two dominated middle-distance racing in the 1980s. Coe won a total of four Olympic medals (1980, 1984) and set eight world records. From 1992 to 1997 he served as a Conservative member in the House of Commons; in 2000 he was elevated to the House of Lords. Coe also was involved with several athletic organizations.

coeducation Education of males and females in the same school. A modern phenomenon, it was adopted earlier and more widely in the U.S. than in Europe, where tradition proved a greater obstacle to its acceptance. In the 17th century Quaker and other reformers in Scotland, northern England, and New England began urging that girls as well as boys be taught to read the Bible. By the later 18th century girls were being admitted to town schools. By 1900 most U.S. public high schools and some 70% of colleges and universities were coeducational. Pioneering institutions in the U.S. included Oberlin College, Cornell University, and the University of Iowa. In Europe the Universities of Bologna and London and various Scandinavian institutions were the first to open their doors. Other European countries adopted coeducational policies after 1900, and many communist countries instituted strong coeducational programs.

coelacanth Vse-lo-.kanthX Any lobe-finned bony fish of the order Crossopterygii. Members of an extinct suborder are considered to have been

the ancestors of land vertebrates. Modern coelacanths (genus Latimeria) are deep-sea fishes with hollow fin spines. They are powerful, heavy-bodied predators, with highly mobile, limblike fins. They average 5 ft (1.5 m) in length and weigh about 100 lbs (45 kg). Coelacanths appeared about 350 million years ago and were thought to have become extinct 80 million years ago until one was caught in 1938 near the southern coast of Africa in the Indian Ocean. A second species was discovered living near Indonesia in 1998.

Coelacanth (Latimeria chalumnae)

PETER GREEN-ARDEA PHOTOGRAPHICS

coelenterate See cnidarian

Coen, Joel and Ethan (respectively b. Nov. 29, 1955, St. Louis Park, Minn., U.S.; b. Sept. 21, 1958, St. Louis Park) U.S. filmmakers. The brothers were brought up in Minnesota but moved to New York City to write scripts for independent films. Their own first film, Blood Simple (1984), a stylish thriller, was followed by such notable works as Raising Arizona (1987), Miller’s Crossing (1990), Barton Fink (1991), Fargo (1996, Academy Award for direction and screen writing), The Big Lebowski (1998), and O Brother, Where Art Thou? (2000). With Joel serving as director and Ethan as producer, they cowrote all their screenplays, which reflected their offbeat blend of well-paced drama and macabre humour.

coenzyme \,ko-'en-zIm\ Any of a number of freely diffusing organic compounds that function as cofactors with enzymes in promoting a variety of metabolic reactions. Coenzymes participate in enzyme-mediated catalysis in stoichiometric (MOLE-for-mole) amounts, are modified during the reaction, and may require another enzyme-catalyzed reaction to restore them to their original state. Examples include nicotinamide adenine dinucleotide (NAD), which accepts hydrogen (and gives it up in another reaction), and ATP, which gives up phosphate groups while transferring chemical energy (and reacquires phosphate in another reaction). Most of the B vitamins (see vitamin B complex) are coenzymes and are essential in facilitating the transfer of atoms or groups of atoms between molecules in the formation of carbohydrates, fats, and proteins. See also metabolism; STOICHIOMETRY.

Coercive Acts See Intolerable Acts

Coetzee \kut-'se\, J(ohn) M(ichael) (b. Feb. 9, 1940, Cape Town, S.Af.) South African novelist. Coetzee taught English at the University of Cape Town, translated works from the Dutch, and wrote literary criticism before publishing his first book, Dusklands (1974). He won international fame with In the Heart of the Country (1977) and Waiting for the Barbarians (1980), in which he attacked the legacy of colonialism; they were followed by The Life and Times of Michael K (1983, Booker Prize), which concerns a man of limited intelligence caught in a civil war; Foe

(1986), a twist on Daniel Defoe's Robinson Crusoe ; the autobiographical Boyhood (1997); and others. Among his nonfiction works are Giving Offense: Essays on Censorship (1996) and The Lives of Animals (1999). In 1999 he became the first writer to win the Booker Prize twice when he received the award for his novel Disgrace (1999). In 2003 Coetzee won the Nobel Prize for Literature.

Coeur \'kcer\, Jacques (b. c. 1395, Bourges, Fr. — d. Nov. 25, 1456, probably Chios in the Aegean Sea) French merchant and royal official. A member of the council of King Charles VII, he was put in charge of tax collection, and was ennobled in 1441. He built a great commercial empire

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that dealt in salt, silks, and many other commodities, and with his huge wealth he funded the king's reconquest of Normandy (1450) and made loans to many aristocrats. Falsely accused of poisoning the king's mistress and of dishonest speculation, he was arrested in 1451 but escaped to Italy. He died while commanding a naval expedition against the Turks.

cofactor An atom, organic molecule, or molecular group that is necessary for the catalytic activity (see catalysis) of many enzymes. A cofactor may be tightly bound to the protein portion of an enzyme and thus be an integral part of its functional structure, or it may be only loosely associated and free to diffuse away from the enzyme. Cofactors of the integral kind include metal atoms — such as iron, copper, or magnesium — or moderately sized organic molecules called prosthetic groups; many of the latter contain a metal atom, often in a coordination complex (see transition element). Removal of the cofactor from the enzyme's structure causes loss of its catalytic activity. Loosely associated cofactors are called coenzymes; examples include most members of the vitamin B complex. Rather than directly contributing to the catalytic ability of an enzyme, coenzymes participate with the enzyme in the catalytic reaction. Sometimes this distinction in definition is no longer made, and coenzyme is used in the broader sense of cofactor.

coffee Tropical evergreen shrub of the genus Coffea, in the madder family, or its seeds, called beans; also the beverage made by brewing the roasted and ground beans with water. Two of the 25 or more species, C. arabica and C. canephora, supply almost all the world's coffee. Arabica coffee is considered to brew a more flavourful and aromatic beverage than Robusta, the main variety of C. canephora. Arabicas are grown in Central and South America, the Caribbean, and Indonesia, Robustas mainly in Africa. The shrub bears bouquets of small white flowers with a jasminelike fragrance. The fruit, 0.5-0.75 in. (13-19 mm) long and red when mature, is called a cherry. Coffee contains large amounts of caffeine, the effects of which have always been an important element in the drink's popularity. Coffee drinking began in 15th-century Arabia. It reached Europe by the

mid 17th century and immediately became hugely popular. Coffee is now consumed by about one-third of the world’s population.

coffer In architecture, a square or polygonal ornamental sunken panel used in a series as decoration for a ceiling or vault. Coffers were probably originally formed by wooden beams crossing one another to produce a grid. The earliest surviving examples were made of stone by the ancient Greeks and Romans. Coffering was revived in the Renaissance and was common in Baroque and Neoclassical architecture.

cofferdam Watertight enclosure from which water is pumped to expose the bed of a body of water in order to permit the construction of a pier or other hydraulic work. Cofferdams are made by driving metal sheetpiling (a series of thin, interlocking panels) into the bed to form a watertight fence. Roman engineers used cofferdams to found the piers of their arch bridges and aqueducts. See also CAISSON.

Coffin, Levi (b. Oct. 28, 1798,

New Garden, N.C., U.S. — d. Sept. 16, 1877, Cincinnati, Ohio) U.S. abolitionist. Despite little formal education, he became a teacher. As a devout Quaker, he opposed slavery. In 1826 he moved to Newport, Ind., where he made his home into a depot of the Underground Railroad and used much of his wealth as a merchant to help the escaping slaves. In 1847 he moved to Cincinnati, where he opened a store selling goods made only by free labour. He continued his work with the Underground Railroad until the outbreak of the American Civil War; he then worked to aid liberated slaves.

cogeneration In power systems, use of steam for both power generation and heating. High-temperature, high-pressure steam from a boiler and superheater first passes through a turbine to produce power. It is exhausted at a temperature and pressure suitable for heating purposes, instead of being expanded in the turbine to the lowest possible pressure and then

discharged to the condenser, which would waste the remaining energy in the steam. The steam at the higher pressure can provide large amounts of lower-temperature energy for heating buildings or evaporating brine in a chemical plant. Considerable overall energy savings can be obtained by cogeneration. See also steam engine.

cogito, ergo sum Latin "I think, therefore I am" Dictum coined in 1637 by Rene Descartes as a first step in demonstrating the attainability of certain knowledge. It is the only statement to survive the test of his methodic doubt. The statement is indubitable, Descartes argued, because even if an all-powerful demon were to try to deceive him into thinking he exists when he does not, Descartes would have to exist in order to be

deceived. Therefore, whenever he thinks, he exists. Furthermore, Descartes maintained, the statement “I am” (sum) expresses an immediate intuition, not the conclusion of a process of reasoning, and is thus indubitable.

cognac \'kon-,yak\ Brandy from the French departments of Charente and Charente-Maritime. Tracing its origin to the 17th century, cognac (named for the town of Cognac) is distilled from white wine in special pot stills (alembics) and aged in Limousin oak. Most cognacs spend from one and one-half to five years in wood, though rarer varieties may age much longer.

cognition Act or process of knowing. Cognition includes every mental process that may be described as an experience of knowing (including perceiving, recognizing, conceiving, and reasoning), as distinguished from an experience of feeling or of willing. Philosophers have long been interested in the relationship between the knowing mind and external reality; psychologists took up the study of cognition in the 20th century. See also cognitive psychology; cognitive science; philosophy of mind.

cognitive dissonance Mental conflict that occurs when beliefs or assumptions are contradicted by new information. The concept was introduced by the psychologist Leon Festinger (1919-89) in the late 1950s. He and later researchers showed that, when confronted with challenging new information, most people seek to preserve their current understanding of the world by rejecting, explaining away, or avoiding the new information or by convincing themselves that no conflict really exists. Cognitive dissonance is nonetheless considered an explanation for attitude change.

cognitive psychology Branch of psychology devoted to the study of human cognition, particularly as it affects learning and behaviour. The field grew out of advances in Gestalt, developmental, and comparative psychology and in computer science, particularly information-processing research. Cognitive psychology shares many research interests with cognitive science, and some experts classify it as a branch of the latter. Contemporary cognitive theory has followed one of two broad approaches: the developmental approach, derived from the work of Jean Piaget and concerned with “representational thought” and the construction of mental models (“schemas”) of the world, and the information-processing approach, which views the human mind as analogous to a sophisticated computer system.

cognitive science Interdisciplinary study that attempts to explain the cognitive processes of humans and some higher animals in terms of the manipulation of symbols using computational rules. The field draws particularly on the disciplines of artificial intelligence, psychology (see cognitive psychology), linguistics, neuroscience, and philosophy. Some chief areas of research in cognitive science have been vision, thinking and reasoning, memory, attention, learning, and language processing. Early theories of cognitive function attempted to explain the evident compositionality of human thought (thoughts are built up of smaller units put together in a certain way), as well as its productivity (the process of putting together a thought from smaller units can be repeated indefinitely to produce an infinite number of new thoughts), by assuming the existence of discrete mental representations that can be put together or taken apart according to rules that are sensitive to the representations’ syntactic, or structural, properties. This “language of thought” hypothesis was later challenged by an approach, variously referred to as connectionism,

parallel-distributed processing, or neural-network modeling, according to which cognitive processes (such as pattern recognition) consist of adjustments in the activation strengths of neuronlike processing units arranged in a network.

cognitivism In metaethics, the thesis that the function of moral sentences (e.g., sentences in which moral terms such as “right,” “wrong,”

Baroque coffered ceiling of the cupola of S. Carlo alle Quattro Fontane, Rome, designed by Francesco Borromini, 1638-41

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and “ought” are used) is to describe a domain of moral facts existing independently of our subjective thoughts and feelings, and that moral statements can accordingly be thought of as objectively true or false. Cognitivists typically try to support their position by seeking out analogies between moral discourse, on the one hand, and scientific and everyday factual discourse, on the other. Cognitivism is opposed by various forms of noncognitivism, all of which have in common the denial of the cognitivist claim that the function of moral sentences is to state or describe facts.

Cohan Vko-.hanX, George M(ichael) (b. July 3, 1878, Providence, R.I., U.S.— d. Nov. 5, 1942, New York, N.Y.) U.S. actor, songwriter, playwright, and producer. Cohan with his parents and sister performed in vaudeville as The Four Cohans.

He began writing for the New York stage in the early 1900s; his musical Little Johnny Jones (1904; film,

1930) included the classics “Give My Regards to Broadway” and “Yankee Doodle Dandy.” Among his later productions were The Governor’s Son (1901), The Talk of New York (1907), Broadway Jones (1912), Seven Keys to Baldpate (1913), and American Born (1925).

He later appeared in shows such as Ah, Wilderness! (1933) and I’d

Rather Be Right (1937). His best-known songs include “You’re a Grand Old Flag,” “Mary’s a Grand Old Name,” and the famous World War I recruiting song “Over There,” for which he was awarded a special Congressional medal in 1940. Cohan was the subject of the film Yankee Doodle Dandy (1942) and the musical George M! (1968).

cohen \'ko-3n\ or kohen \ko-'han, ko-'hen\ (Hebrew: “priest”) Jewish priest descended from Zadok (a descendant of Aaron), priest at the First Temple of Jerusalem. The biblical priesthood was hereditary and male. Before King Josiah’s reign (7th century bc), the high priest alone could enter the Holy of Holies on Yom Kippur. Lower-ranking priests accompanied the army in war or administered the Temple. The priestly class was strongest during the period of the Second Temple and was curtailed after its destruction. The rabbinate has replaced the kohanim as authorities on the Law, but kohanim retain some privileges (except in Reform Judaism).

coherentism Theory of truth according to which a belief is true just in case, or to the extent that, it coheres with a system of other beliefs. Philosophers have differed over the relevant sense of “cohere,” though most agree that it must be stronger than mere consistency. Among rival theories of truth, perhaps the oldest is the correspondence theory, which holds that the truth of a belief consists in its correspondence with independently existing facts. In epistemology, coherentism contrasts with foundationalism, which asserts that ordinary beliefs are justified if they are inferrable from a set of basic beliefs that are justified immediately or directly. Coherentism often has been combined with the idealist doctrine that reality consists of, or is knowable only through, ideas or judgments (see idealism).

Cohn, Edwin Joseph (b. Dec. 17, 1892, New York, N.Y, U.S. — d. Oct. 1, 1953, Boston, Mass.) U.S. biochemist. He received his Ph.D. from the University of Chicago and taught at Harvard 1922-53. He studied the components of protein molecules, correlating their structures with their physical properties and determining basic principles that became the foundation for the further study of proteins. In World War II he headed a team that devised methods of large-scale production of human plasma fractions for treatment of the wounded.

Cohn, Ferdinand (Julius) (b. Jan. 24, 1828, Breslau, Silesia, Prussia — d. June 25, 1898, Breslau) German naturalist and botanist, considered one of the founders of bacteriology. He received a Ph.D. from the University of Berlin at age 19. His early research centred on the single-celled algae, and his accounts of the life histories of various algae species are of permanent value. He was among the first to attempt to arrange bacteria into genera and species on a systematic basis. Among his most striking contributions was his discovery of the formation and germination

of spores in certain bacteria. During his lifetime Cohn was recognized as the foremost bacteriologist of his day.

Cohn, Harry (b. July 23, 1891, New York, N.Y., U.S. — d. Feb. 27, 1958, Phoenix, Ariz.) U.S. film producer and cofounder of Columbia Pictures. He worked for a film distributor before cofounding C.B.C. Film Sales Co. (1920), later named Columbia Pictures Corp. In 1932 he became president of the company, which he built into a major studio. Though he came to epitomize the ruthless philistine movie mogul, he was credited

with discovering many stars, including Rita Hayworth, and promoting such directors as Frank Capra.

Cohnheim, Julius Friedrich (b. July 20, 1839, Demmin, Prussia — d. Aug. 15, 1884, Leipzig) German pioneer of experimental pathology. While assisting Rudolf Virchow, he confirmed that inflammation results from passage of leukocytes through capillary walls into tissues and that pus is mainly debris from their disintegration. His induction of tuberculosis in a rabbit's eye led to Robert Koch's discovery of the tuberculosis bacillus. His Lectures on General Pathology (2 vol., 1877-80) far outlasted contemporary texts. His method of freezing tissue for thin slicing for microscopic examination is a standard clinical procedure.

coho or silver salmon Species (Oncorhynchus kisutch) of salmon prized for food and sport that ranges from the Bering Sea to Japan and the Salinas River of Monterey Bay, Cal. It weighs about 10 lbs (4.5 kg) and is recognized by the small spots on the back and upper tail-fin lobe. Young cohos stay in freshwater for about one year before entering North Pacific waters; they mature in about three years. Some landlocked populations spend their entire lives in freshwater. Cohos were successfully transplanted in the 1970s into Lake Michigan as a game fish.

coin collecting Systematic accumulation and study of coins, tokens, paper money, and objects of similar form and purpose. The long-held view that coin collecting began with the Italian Renaissance has been challenged by growing evidence that the activity is far more venerable. There exist a variety of literary accounts of collecting from ancient Greek and Roman sources, and there is tangible archaeological evidence that coins have been collected at least from the Roman era. Collecting was perhaps less important during the Middle Ages, but during the 15th- 16th centuries it again became more popular, mostly among European aristocrats. In the 17th century the nature of collecting shifted slowly toward serious research. As a result, very broad collections were formed, studied, and catalogued. In the 20th century museums took over the main task of forming large collections of great detail and range. It was also during this time that a popular market for coins began to develop. Previously only the very wealthy purchased ancient coins and the number of sources were few. London became the world's largest numismatic market, serving the interests of public collections and private collectors in many lands. The Internet became an important aspect of coin collecting in the late 1990s, both because it afforded a virtual marketplace that permitted buyers and sellers from anywhere in the world to trade in coins and for the educational effect of the many Web sites devoted to the hobby. See also philately.

coinage Certification of a piece of metal or other material (such as leather or porcelain) by a mark or marks upon it as being of a specific intrinsic or exchange value. Croesus (r. c. 560-546 bc) is generally credited with issuing the first official government coinage of certified purity and weight. Counterfeiting was widespread in the Middle Ages. In the late 15th century, equipment capable of providing coins of reliable weight and size was developed in Italy. The Industrial Revolution saw further refinements in coinage techniques. Most of the basic motifs of modern coinage were introduced in antiquity. In the Greek world, relief imprinting gradually replaced the roughly impressed reverse punch of the Lydians. Alexander the Great introduced the coin-portrait; these initially depicted gods or heroes and later living monarchs. Until the end of the 19th century, Chinese coins were cast much like those of the early Greeks; the square-holed Chinese bronze coins were issued in essentially the same

size and shape for almost 2,500 years.

coitus See sexual intercourse

coke Solid residue remaining after certain types of coals are heated to a high temperature out of contact with air until substantially all components that easily vaporize have been driven off. The residue is chiefly carbon, with minor amounts of hydrogen, nitrogen, sulfur, and oxygen. Also present in coke is the mineral matter in the original coal, chemically altered and decomposed. The gradual exhaustion of timber in England

George M. Cohan.

PICTORIAL PARADE

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had led first to prohibitions on cutting of wood for charcoal and eventually to the introduction of coke. Thereafter the iron industry expanded rapidly and Britain became the world’s greatest iron producer (see Abraham Darby). The crucible process (1740) resulted in the first reliable steel made by a melting process. Oven coke (about 1.5-4 in., or 40-100 mm, in size) is used in blast furnaces to make iron. Smaller quantities of coke are used in other metallurgical processes (see metallurgy), such as the manufacture of certain alloys. Large, strong coke, known as foundry coke, is used in smelting. Smaller sizes of coke (0.6-1. 2 in., or 15-30 mm) are used to heat buildings.

Coke \kuk\, Sir Edward (b. Feb. 1, 1552, Mileham, Norfolk, Eng. — d. Sept. 3, 1634, Stoke Poges, Buckinghamshire) British jurist and politician. He became a lawyer in 1578 and was made solicitor general in 1592. His advance to the position of attorney general (1594) frustrated his great rival, Francis Bacon. As attorney general, he conducted several famous treason trials, prosecuting Robert Devereux, 2nd earl of Essex, and Henry Wriothesley, 3rd earl of Southampton (1600-01); Sir Walter Raleigh (1603); and the Gunpowder Plot conspirators (1605). Named chief justice of the Court of Common Pleas in 1606, Coke earned the ire of James I by declaring that the king’s proclamation could not change the law (1610). He upset church leaders by limiting the jurisdiction of ecclesiastical courts. Appointed chief justice of the King’s Bench by James I (1613), he remained unswayed; he hinted at scandal in high places and defied a royal injunction in a case involving ecclesiastical privileges. He was dismissed in 1616, partly through Bacon’s efforts. In 1620 he reentered Parliament (he had served in 1589), where he denounced interference with Parliament’s liberties (1621) until he was imprisoned. In 1628 he helped frame the Petition of Right, a charter of liberties; this defense of the supremacy of the common law over royal prerogative had a profound influence on the English law and constitution. On his death his papers

were seized by Charles I. His Reports (1600-15), taken together, are a monumental compendium of English common law, and his Institutes of the Lowes of England (4 vol., 1628-44) is an important treatise.

Cola di Rienzo Vk6-la-de-'ryent-so\ orig. Nicola di Lorenzo (b.

1313, Rome — d. Oct. 8, 1354, Rome) Italian revolutionary leader. The son of a tavern keeper, he became a minor Roman official. He plotted a revolution to restore the glory of ancient Rome, declared himself tribune in 1347, and began to rule Rome as a dictator. Cola made judicial and political reforms and prepared for the election of a Roman emperor of Italy. The nobles rose against him, however, and the pope declared him a heretic. He fled to the mountains, then traveled to Prague to ask Charles IV for help. He was arrested (1352) but was absolved of heresy by the Inquisition. Given the title of senator, he was sent back to Rome in 1354 to help restore papal authority there. He ruled arbitrarily and was soon killed by a mob. A novel of his life by Edward Bulwer-Lytton was made into an opera by Richard Wagner.

Cola dynasty or Chola dynasty South Indian Tamil rulers of unknown antiquity (before c. ad 200). The dynasty originated in the rich Cauvery (Kaveri) River valley, and Uraiyur (Tiruchchirappalli) was its oldest capital. The Cola country stretched from the Vaigai River in the south to Tondaimandalam in the north. Under Rajendracola Deva I (r. 1014^14), the conquest of Ceylon (Sri Lanka) was completed, the Deccan was conquered (c. 1021), and an expedition was sent as far north as the Ganges (Ganga) River (1023). His successor battled the Calukya dynasty in the Deccan. The Pandyas conquered the Cola country in 1257, and the dynasty ended in 1279. Revenue administration, village self-government, and irrigation were highly organized under the Colas.

cola nut See kola nut

Colbert Xkol-'borN, Claudette orig. Lily Claudette Chauchoin (b.

Sept. 13, 1903, Paris, France — d. July 30, 1996, Cobblers Cove, Barb.) French-born U.S. actress. She made her Broadway debut in 1923 and her film debut in Frank Capra's For the Love of Mike (1927). After winning stardom with It Happened One Night (1934, Academy Award), she played the sophisticated heroine of several other comedies, including Midnight (1939) and The Palm Beach Story (1942), and played dramatic roles in Imitation of Life (1934) and Since You Went Away (1944). She made more than 60 films and later appeared occasionally on Broadway and in television dramas.

Colbert \kol-'ber\, Jean-Baptiste (b. Aug. 29, 1619, Reims, France — d. Sept. 6, 1683, Paris) French statesman. He was recommended to Louis XIV by Jules Mazarin, whose personal assistant he had been. He engineered the downfall of Nicolas Fouquet, and thereafter he served the king both in his private affairs and in the administration of the kingdom.

As controller general of finance from 1665, he brought order to financial operations, reformed the chaotic sys-

tem of taxation, and reorganized industry and commerce. As secretary of state for the navy from 1668, he undertook to make France a great power at sea. He also sought to promote emigration to Canada and to enhance France's power and prestige in the arts. Though a series of wars prevented the fulfillment of all his reforms, he strengthened the monarchy and improved the country's public administration and economy, helping make France the dominant power in Europe.

Colchester ancient Camulodunum City and borough (pop., 2001: 155,794), southeastern England. In ancient times, the city was the capital of the powerful pre-Roman ruler Cunobelinus. After his death, the enmity of his sons toward Rome encouraged the Roman invasion of Britain, and it became the first Roman colony there, founded by Claudius c. ad 43. Burned by Boudicca's warriors c. ad 60, it was reestablished and received its first charter in 1189. In the 13th century it was a major port. It has a long history in both cloth making and oyster trading. It is the site of England's largest castle keep (built c. 1080), which now houses a museum of Romano-British antiquities.

Colchis Vkal-kosX Ancient region on the Black Sea. Now the western part of the Republic of Georgia, Colchis was in Greek mythology the home of Medea and the destination of the Argonauts. Historically, it was colonized by Milesian Greeks with the support of the native Colchians, whose ethnic composition is unclear. After the 6th century bc it was nominally controlled by Persia; it passed to Mithradates VI Eupator, the king of Pontus, in the 1st century bc and later came under Roman rule.

Cold War Open yet restricted rivalry and hostility that developed after World War II between the U.S. and the Soviet Union and their respective allies. The U.S. and Britain, alarmed by the Soviet domination of Eastern Europe, feared the expansion of Soviet power and communism in Western Europe and elsewhere. The Soviets were determined to maintain control of Eastern Europe, in part to safeguard against a possible renewed threat from Germany. The Cold War (the term was first used by Bernard Baruch during a congressional debate in 1947) was waged mainly on political, economic, and propaganda fronts and had only limited recourse to weapons. It was at its peak in 1948-53 with the Berlin blockade and airlift, the formation of NATO, the victory of the communists in the Chinese civil war, and the Korean War. Another intense stage occurred in 1958-62 with the Cuban missile crisis, which resulted in a weapons buildup by both sides. A period of detente in the 1970s was followed by renewed hostility. The Cold War ended with the collapse of the Soviet Union in 1991.

cold, common Viral infection of the upper and sometimes the lower respiratory tract. Symptoms, which are relatively mild, include sneezing, fatigue, sore throat, and stuffy or runny nose (but not fever); they usually last only a few days. About 200 different strains of virus can produce colds; they are spread by direct or indirect contact. The cold is the most common of all illnesses; the average person gets several every year. Incidence peaks in the fall. Treatment involves rest, adequate fluid intake, and over-the-counter remedies for the symptoms. Antibiotics do not combat the

virus but may be given if secondary infections develop.

Cole, Nat King orig. Nathaniel Adams Coles (b. March 17, 1917, Montgomery, Ala., U.S. — d. Feb. 15, 1965, Santa Monica, Calif.) U.S. jazz pianist and singer. Cole grew up in Chicago and formed a trio in Los Angeles (1939), establishing himself as a major jazz piano stylist. Commercial success, however, came with his singing. His warm, relaxed voice brought a personal touch to the ballads and light swing in which he specialized. “Mona Lisa” and “Unforgettable” were among his major hits of the 1950s. He excelled as a stage personality, and he was also a capable film actor.

Jean-Baptiste Colbert, detail of a bust by Antoine Coysevox, 1 677; in the Louvre, Paris.

GIRAUDON/ART RESOURCE, NEW VORK

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Cole, Thomas (b. Feb. 1, 1801, Bolton-le-Moors, Lancashire, Eng. — d. Feb. 11, 1848, Catskill, N.Y., U.S.) British-born U.S. landscape painter, founder of the Hudson River school. After immigrating to the U.S. with his family in 1819, he studied at the Pennsylvania Academy of the Fine Aits. In 1825 Asher B. Durand began purchasing his work and finding him patrons. After settling in Catskill, N.Y., Cole traveled throughout the northeast making pencil sketches of the scenery, from which he later produced finished paintings in his studio. He is famous for his views of the Hudson Valley, as well as for grandiose imaginary vistas.

Colebrook, Leonard (b. March 2, 1883, Guildford, Surrey, Eng. — d. Sept. 29, 1967, Farnham Common, Buckinghamshire) English medical researcher. He introduced (1935) the use of Prontosil, the first sulfonamide antibacterial drug, as a cure for puerperal fever. He also researched burn treatment, proving that sulfonamides and penicillin could control infection, urging wider use of skin grafting, and bringing the problem of tissue rejection to the attention of Peter Medawar.

Coleman, (Randolph Denard) Ornette (b. March 9, 1930, Fort Worth, Texas, U.S.) U.S. saxophonist and composer, the principal initiator and leading exponent of free jazz. Coleman began playing the saxophone as a teenager and soon became a working musician in dance bands and rhythm-and-blues groups. He abandoned harmonic patterns in order to improvise more directly upon melodic and expressive elements; because the tonal centres of such music changed at the improviser’s will, it became known as “free jazz.” His organized collective improvisation in such recordings as Free Jazz (1960) placed him firmly in the jazz avant-garde. In the 1970s he began composing orchestral music and also formed

an electric band called Prime Time, with which he was active until the 1990s.

Coleraine \kbl-'ran\ District (pop., 2001: 56,315), Northern Ireland. Established in 1973, it is primarily an agricultural area. Flint implements found there date back to nearly 7000 bc and provide the earliest evidence of human occupation in Ireland. The administrative centre, Coleraine town, on the River Bann, was colonized by companies from the City of London in the 17th century; it is the seat of the New University of Ulster (founded 1965).

Coleridge \'kol-rij\, Samuel Taylor (b. Oct. 21, 1772, Ottery St. Mary, Devonshire, Eng. — d. July 25,

1834, Highgate, near London)

English poet, critic, and philosopher.

Coleridge studied at the University of Cambridge, where he became closely associated with Robert Southey. In his poetry he perfected a sensuous lyricism that was echoed by many later poets. Lyrical Ballads (1798; with William Wordsworth), containing the famous “Rime of the Ancient Mariner” and “Frost at Midnight,” heralded the beginning of English Romanticism. Other poems in the “fantastical” style of the “Mariner” include the unfinished “Christabel” and the celebrated “Pleasure Dome of Kubla Khan.” While in a bad marriage and addicted to opium, he produced “Dejection: An Ode”

(1802), in which he laments the loss of his power to produce poetry.

Later, partly restored by his revived Anglican faith, he wrote Biographia Literaria , 2 vol. (1817), the most significant work of general literary criticism of the Romantic period. Imaginative and complex, with a unique intellect, Coleridge led a restless life full of turmoil and unfulfilled possibilities.

Colet Vka-loA, John (b. 1466/67, London, Eng. — d. Sept. 16, 1519, Sheen, Surrey) British theologian. He studied mathematics and philosophy at Oxford and extended his studies abroad. Returning to England, he became ordained, sometime before 1499. He was appointed dean of St. Paul’s Cathedral in 1504 and founded St. Paul’s School around 1509. One of the chief Tudor humanists, he promoted Renaissance culture in England and influenced such humanists as Desiderius Erasmus, St. Thomas More, and Thomas Lnacre.

Colette \ko-'let\ in full Sidonie-Gabrielle Colette (b. Jan. 28, 1873, Saint-Sauveur-en-Puisaye,

France — d. Aug. 3, 1954, Paris)

French writer. Her first four Claudine novels (1900-03), the reminiscences of a libertine ingenue, were published by her first husband, an important critic, under his pen name,

Willy. After separating from him, she worked as a music-hall performer, a life she fictionalized in The Vagabond (1910). Among her mature works are Cheri (1920), My Mother's House (1922), The Ripening Seed (1923), The Last of Cheri (1926), Sido (1930), and Gigi (1944; musical film, 1958), a comedy about a girl reared to be a courtesan. Her novels of the pleasures and pains of love are remarkable for their exact evocation of sounds, smells, tastes, textures, and colours. In her highly eventful life, she freely flouted convention and repeatedly scandalized the French public, but by her late years she had become a national icon.

coleus Any member of the Old World tropical plant genus Coleus, containing about 150 species, in the mint family, best known for its colourful foliage. Varieties of C. blumei, from Java, are well-known houseplants and garden plants. They have square stems and small, blue, two-lipped flowers in spikes. Bush coleus (C. thrysoideus), from Central Africa, produces sprays of bright blue flowers. Others are variously known as flame nettle, painted leaves, painted nettle, Spanish thyme, Indian borage, country borage, and flowering bush.

Colfax, Schuyler (b. March 23, 1823, New York, N.Y., U.S. — d. Jan. 15, 1885, Mankato, Minn.) U.S. politician. He founded the St. Joseph Valley Register, which became one of Indiana's most influential newspapers during his editorship (1845-63). He was a member of the U.S. House of Representatives (1854-69), where he served as speaker (1863-69) and a leader of the Radical Republicans. His vice presidency under Pres. Ulysses S. Grant (1869-73) was marred by his implication in the Credit Mobilier scandal (1872).

Colgate-Palmolive Co. Diversified U.S. company that manufactures household, health-care, and personal care products. It began in the early 19th century, when William Colgate, a soapmaker and candlemaker, began selling his wares in New York City. His company sold the first toothpaste in a tube in 1908, and in 1928 it was bought by the makers of Palmolive soap. Its current name was adopted in 1953. Its headquarters are in New York City.

Colgate University Private university in Hamilton, N.Y. It was founded in 1819 as a Baptist-affiliated institution but became independent in 1928. It offers primarily a liberal arts curriculum for undergraduates, with some master's degree programs in arts and teaching. Women were first admitted in 1970 and now represent half of the student body.

colic \'ka-lik\ Any sudden, violent pain, especially that produced by con-

traction of the muscular walls of a hollow organ whose opening is partly or completely blocked. In infants, intestinal colic is characterized by drawing up of the legs, restlessness, and constant crying. Colic may accompany enteritis (intestinal inflammation) or an intestinal tumour, as well as certain forms of influenza. Colic caused by spastic bowel contractions is common in lead poisoning. Treatment, aimed at symptom relief, often includes use of a muscle relaxant.

coliform bacteria Vko-lo-.fomA Rod-shaped bacteria usually found in the intestinal tracts of animals, including humans. Coliform bacteria do not require but can use oxygen, and they do not form spores. They produce acid and gas from the fermentation of lactose sugar. Their presence in the water supply indicates recent contamination by human or animal feces. Chlorination is the most common preventive water treatment.

Coligny V.ko-.len-'yeA Ako-'len-yoV Gaspard II de, lord de

Chatillon (b. Feb. 16, 1519, Chatillon- sur-Loing, France — d. Aug. 24, 1572, Paris) French soldier and leader of the Huguenots in the French Wars of Religion. He served in the Italian campaign (1544), won renown

Samuel Taylor Coleridge, detail of an oil painting by Washington Allston, 1814; in the National Portrait Gallery, London.

COURTESY OF THE NATIONAL PORTRAIT GALLERY, LONDON

Colette, 1 937.

CHARLES LEIRENS/BLACK STAR

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for his skill and bravery, and was made admiral of France (1552). He announced his support for the Reformation in 1560, joined the fight when civil war broke out in 1562, and became sole leader of the Huguenots in 1569. Later he began to exert influence over Charles IX and came to be seen as a threat by Catherine de Medicis. After Catherine’s

attempt to instigate his assassination failed, she convinced the king that the Huguenots were plotting to retaliate against Charles himself.

Charles then ordered the deaths of Coligny and the Huguenot leaders in the Massacre of Saint Bartholomew's Day.

Colima \ko-'le-m3\ State (pop.,

2000: 542,627), western Mexico.

Covering 2,004 sq mi (5,191 sq km), which includes the Revillagigedo Islands, its capital is Colima city.

Situated along the Pacific coast, most of the small state lies in the narrow coastal plain, beyond which it rises into the foothills of the Sierra Madre. The soil is generally fertile and productive, but a lack of transportation has impeded development. Agriculture is the principal occupation; livestock raising is important in the highlands.

Colima City (pop., 2000: 119,639), capital of Colima state, Mexico. Located in west-central Mexico, it lies on the Colima River in the foothills of the Sierra Madre. Founded in 1522, it has played only a minor role in Mexican history because of its inaccessibility. Its industries centre on processing local agricultural products. It is the site of the University of Colima (1867).

collage \ko-'lazh\ (from French colter, “to glue”) Pictorial technique of applying printed or found materials (e.g., newspaper, fabric, wallpaper) to a flat surface, often in combination with painting. Long popular as a pastime for children and amateurs, it was first given serious attention as an art technique by Pablo Picasso and Georges Braque in 1912-13. Many other 20th-century artists produced collages, including Juan Gris, Henri Matisse, Joseph Cornell, and Max Ernst. In the 1960s collage was employed as a major form of Pop art, exemplified in the work of Robert Rauschenberg.

collagen Vka-lo-jonX Any of a class of organic compounds, the most abundant proteins in the animal kingdom, occurring widely in tendons, ligaments, dentin (see tooth), cartilage, and other connective tissues. Their molecules share a triple-helix configuration. Collagens occur as whitish, inelastic fibres of great tensile strength and low solubility in water. Soluble when first synthesized (the form used in personal-care preparations), collagen changes to a more stable, insoluble form. Glue made from collagen in animal hides and skins is a widely used adhesive. Specially treated forms of collagen are used in medicine and surgery (including lip implants and other cosmetic surgery), in prostheses, and as sausage casings. Collagen is converted to gelatin by boiling it in water.

collard Headless form of cabbage (Brassica oleracea, Acephala group), in the mustard family. It bears the same botanical name as kale, differing only in that collard leaves are much broader, are not frilled, and resemble the rosette leaves of head cabbage. The main stem has a rosette of leaves at the top. Lower leaves commonly are harvested progressively; some-

times the entire young rosette is harvested. The leaves are highly nutritious, rich in minerals and in vitamins A and C.

collective bargaining Process of negotiation between representatives of workers (usually labour union officials) and management to determine the conditions of employment. The agreement reached may cover not only wages but hiring practices, layoffs, promotions, working conditions and hours, and benefit programs. Collective bargaining developed in England at the end of the 18th century. Although collective bargaining agreements are common in many countries, they are more scarce in developing countries that have large pools of surplus labour. Contract negotiations may occur at the national, regional, or local level, depending on the structure of industry within a country. See also labour union; strike.

collective farm Russian kolkhoz. In the former Soviet Union, a cooperative agricultural enterprise operated on state-owned land. Under the policy of collectivization, which was pursued most intensively by Joseph Stalin in 1929-33, peasants were forced to give up their individual farms and join large collective farms. They objected violently and in many cases slaughtered their livestock and destroyed their equipment before joining. By 1936 almost all the peasantry had been collectivized, though millions had also been deported to prison camps. With the breakup of the Soviet Union in 1990-91, the collective farms began to be privatized.

collectivism Any of several types of social organization that ascribe central importance to the groups to which individuals belong (e.g., state, nation, ethnic group, or social class). It may be contrasted with individualism. Jean-Jacques Rousseau was the first modem philosopher to discuss it (1762). Karl Marx was its most forceful proponent in the 19th century. Communism, fascism, and socialism may all be termed collectivist systems. See also communitarianism; kibbutz; moshav.

college Institution that offers postsecondary education. The term has various meanings. In Roman law a collegium was a body of persons associated for a common function. The name was used by many medieval institutions, including guilds. In most universities of the later Middle Ages, collegium meant an endowed residence hall for university students. The colleges kept libraries and scientific instruments and offered salaries to tutors who could prepare students to be examined for degrees. Eventually few students lived outside colleges, and college teaching eclipsed university teaching. In England, secondary schools (e.g., Winchester and Eton) are sometimes called colleges. Canada also has collegiate schools. In the U.S., college may refer to a four-year institution of higher education offering a bachelor’s degree, or to a two-year junior or community college with a program leading to the associate’s degree. A four-year college usually emphasizes a liberal arts or general education rather than specialized technical or vocational preparation. The four-year college may be an independent private institution or an undergraduate division of a university.

collider See particle accelerator

collie Breed of working dog developed in Great Britain, probably by the 1 8th century. The rough-coated variety was originally used to guard and herd sheep; the smooth-coated variety was used to drive livestock to market. Both varieties are lithe dogs

with a tapering head, almond-shaped eyes, and erect ears that tip forward at the ends. They stand 22-26 in.

(56-66 cm) tall, weigh 50-75 lb (23-34 kg), and may be variously coloured. See also border collie.

Collingwood, R(obin)

G(eorge) (b. Feb. 22, 1889, Cartmel Fell, Lancashire, Eng. — d. Jan.

9, 1943, Coniston, Lancashire) British historian and philosopher. A lecturer, and later professor, at the University of Oxford (1912 — 41), he was a leading authority on the archaeology and history of Roman Britain. He believed that “the chief business of 20th-century philosophy is to reckon with 20th-century history” and that philosophy and history are both a matter of discovering fundamental presuppositions. In his most influential work. The Idea of History (1946), he maintained that historical thinking requires explanation as part of any description and that it is the philosopher’s task to articulate and justify historical methodology. He is viewed as a seminal thinker in the philosophy of history.

Collins, Michael (b. Oct. 16, 1890, Clonakilty, County Cork, Ire. — d. Aug. 22, 1922, Beal-na-Blath, Cork) Irish national leader. He worked in London (1906-16), then returned to fight in the Easter Rising. Elected as a member of Sinn Fein to the Irish assembly (1918), he became the Irish republic’s first minister of home affairs. He was general of the volunteers and director of intelligence of the Irish Republican Army in the Anglo-Irish War. In 1921 he signed the controversial Anglo-Irish Treaty, which gave Ireland dominion status, though with provisions for partition and for an oath of allegiance to the crown. He and Arthur Griffith then became leaders of the provisional government. When civil war broke out, Collins commanded the government forces fighting the anti-treaty republicans, and on Griffith’s death he became head of the government. Ten days later he was killed in an ambush at age 31.

Gaspard II de Coligny, detail of a portrait by an unknown artist, 1 6 th century; in the Musee Conde, Chantilly, France.

COURTESY OF THE MUSEE CONDE, CHANTILLY, FRANCE; PHOTOGRAPH, GIRAUDON-ART RESROUCE, NEW YORK

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Collins, (William) Wilkie (b. Jan. 8, 1824, London, Eng. — d. Sept. 23, 1889, London) English novelist. After working briefly in commerce and law, he took up writing and became associated with Charles Dickens, who had a formative influence on his career. For two works, he is remembered as one of the first and best writers of English mystery novels. The Woman in White (1860), inspired by an actual criminal case, made him famous. The Moonstone (1868), one of the first English detective novels, introduced features that became conventions in the genre.

colloid \'ka-,l6id\ Substance consisting of particles that, although too tiny to be seen with the unaided eye (typically 1 nanometre to 10 micrometres), are substantially larger than atoms and ordinary molecules and that are dispersed in a continuous phase. Both the dispersed phase and the continuous phase may be solid, liquid, or gas; examples include suspensions, aerosols, smokes, emulsions, gels, sols, pastes, and foams. Colloids are often classified as reversible or irreversible, depending on whether their components can be separated. Dyes, detergents, polymers, proteins, and many other important substances exhibit colloidal behaviour.

Collor de Mello Vko-'lor-do-'me-luX, Fernando (Affonso) (b. Aug. 12, 1949, Rio de Janeiro, Braz.) President of Brazil (1990-92). Born to wealth, he became governor of the small state of Alagoas in 1987. Promising to promote economic growth and combat corruption and inefficiency, he defeated the leftist Luiz Silva in 1989 to become Brazil’s first popularly elected president in nearly 30 years. The country’s economic decline, fueled by a staggering foreign debt and hyperinflation, failed to improve, and he resigned in 1992 as his trial for corruption was about to begin.

Colman, Ronald (Charles) (b. Feb. 9, 1891, Richmond, Surrey, Eng. — d. May 19, 1958, Santa Barbara, Calif., U.S.) British-U.S. film actor. He began a stage and film career in England then moved in 1920 to the U.S., where he first won notice in The White Sister (1923). A romantic leading man, he appeared in other silent films such as Beau Geste (1926), and he easily made the transition to sound movies with his cultivated, expressive voice. His most notable films include Arrow smith (1931), A Tale of Two Cities (1935), Lost Horizon (1937), If I Were King (1938), Random Harvest (1942), and A Double Life (1947, Academy Award).

Colmar, Charles Xavier Thomas de See Charles X. T. de Colmar

colobus Vka-lo-bosN monkey Any of 10 species of long-tailed, essentially thumbless African Old World monkeys in the genus Colobus (family Cercopithecidae). Colobus monkeys are diurnal, generally gregarious vegetarians. They make long leaps from tree to tree. The four species of black-and-white colobus are 22-24 in. (55-60 cm) long, excluding the 30-32-in. (77-82-cm) tail. They are slender and have a long, silky coat. The five species of red colobus are brown or black with red markings and are 1 8-24 in. (46-60 cm) long, excluding the 16-31 -in. (40-80-cm) tail. The olive colobus has short, olive-coloured fur. Several races of red colobus are considered endangered; other colobus species are vulnerable or rare.

Cologne \ko-'lon\ German Koln \'koeln\ City (pop., 2002 est.: city, 967,900; metro, area, 1,823,500), western Germany. Located on the Rhine River, it is one of Europe’s key inland ports. First settled by Romans in the 1st century bc, its commercial importance grew out of its location on the major European trade routes. In the Middle Ages it also became an ecclesiastical centre and an important hub of art and learning. Despite its

almost complete destruction in World War II, the city retains some buildings and monuments of all periods. Its cathedral, the largest Gothic church in northern Europe, is its unofficial symbol. Banking has been an important industry since the Middle Ages. Eau de cologne, first produced commercially in the 18th century, is still made there. The city is also a major media centre, with many publishing houses and production facilities for radio and television. It is famous for its pre-Lenten Carnival.

Colombia officially Republic of Colombia Country, northwestern South America. Area: 440,762 sq mi (1,141,568 sq km). Population (2005 est.): 42,954,000. Capital: Bogota. About half the population are mestizos; most of the rest are of European- African, European, or African ancestry. Language: Spanish (official). Religion: Christianity (predominantly Roman Catholic). Currency: peso. The topography is dominated by the Andes Mountains. To the south and east lie vast lowlands, drained by the Orinoco and Amazon rivers. Colombia’s developing economy is based primarily on services, agriculture, and manufacturing, coffee being the principal cash crop. Coca (for the production of cocaine) and opium poppies (for the production of heroin) are grown and trafficked illicitly on a large scale. Rich in minerals, Colombia is the world’s largest producer of

dent. Its earliest known inhabitants were Chibchan-speaking Indians. The Spanish arrived c. 1500 and by 1538 had conquered the area and made it subject to the Viceroyalty of Peru. After 1740 authority was transferred to the newly created Viceroyalty of New Granada. Parts of Colombia threw off Spanish jurisdiction in 1810, and full independence came after Spain’s defeat by revolutionary leader Simon Bolivar in 1819. Civil war in 1840 slowed development. Conflict between the Liberal and Conservative parties led to the War of a Thousand Days (1899-1903). Years of relative peace followed, but hostility erupted again in 1948; the two parties agreed in 1958 to a plan for alternating governments. A new constitution was adopted in 1991, but democratic power remained threatened by civil unrest, which continued into the early 21st century and at the violent centre of which were powerful drug cartels, leftist guerrillas, and right-wing paramilitary groups.

Colombo Nka-'lom-boV City (pop., 2001 prelim.: 642,163), administrative capital of Sri Lanka. Situated on the western coast of the island, it is a major port with one of the largest artificial harbours in the world. The area was settled in the 8th century by Arab traders. A fort was established by the Portuguese in 1518, and the town was occupied by the Dutch in 1656 and the English in 1796. It became the capital of the island in 1815. Western influence diminished after Sri Lanka gained its independence in 1948. A commercial and industrial centre, Colombo has manufacturing industries that produce machinery and process food products. It is home to the University of Colombo (founded 1921).

Colombo \k6-'lom-bo\, Matteo Realdo (b. 15167, Cremona [Italy] — d. 1559, Rome) Italian anatomist and surgeon. He is credited with the discovery of pulmonary circulation. On Things Anatomical (1559), his only formal written work, includes a description of how the heart pumps blood and outlines the pulmonary circulation and the return of bright-red blood to the heart from the lungs.

colon \'ko-lon\ Segment that makes up most of the large intestine. Though the two terms are often used interchangeably, the colon technically

excludes the cecum (a pouch at the beginning of the large intestine), rectum, and ANAL canal. It runs up the right side of the abdomen (ascending colon), across it (transverse colon), and down the left side (descending colon); its last section (sigmoid colon) joins the rectum. It has no digestive function but lubricates waste products, absorbs remaining fluids and salts, and stores waste products until excretion. Problems involving the colon include ulcerative colitis, constipation and diarrhea, gas discomfort, megacolon (enlarged colon), and cancer.

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Colonial National Historical Park Historical reservation, southeastern Virginia, U.S. Covering some 15 sq mi (38 sq km) and centred on a peninsula between the York and James rivers, it was first established as a national monument in 1930 and includes colonial and Revolutionary sites. It embraces Cape Henry, Jamestown, and Yorktown and includes the Colonial Parkway, a 23-mi (37-km) scenic route linking Jamestown, Williamsburg, and Yorktown.

colonialism Control by one power over a dependent area or people. The purposes of colonialism include economic exploitation of the colony's natural resources, creation of new markets for the colonizer, and extension of the colonizer's way of life beyond its national borders. The most active practitioners were European countries; in the years 1500-1900, Europe colonized all of North and South America and Australia, most of Africa, and much of Asia by sending settlers to populate the land or by taking control of governments. The first colonies were established in the Western Hemisphere by the Spanish and Portuguese in the 15th-16th century. The Dutch colonized Indonesia in the 16th century, and Britain colonized North America and India in the 17th– 1 8th century. Later British settlers colonized Australia and New Zealand. Colonization of Africa only began in earnest in the 1880s, but by 1900 virtually the entire continent was controlled by Europe. The colonial era ended gradually after World War II; the only territories still governed as colonies today are small islands. See also decolonization, dependency, imperialism.

colonnade Row of columns generally supporting an entablature, used either as an independent feature (e.g., a covered walkway) or as part of a building (e.g., a PORTICO). The earliest colonnades appear in the temple architecture of ancient Greece. In a basilica, colonnades are used to separate the side aisles from the central space. See also stoa.

colony In antiquity, any of the new settlements established in territory conquered by the Greeks (8th-6th century bc), Alexander the Great (4th century bc), and the Romans (4th century bc-ad 2nd century). Greek colonies extended to Italy, Sicily, Spain, the eastern Mediterranean (including Egypt), and the Black Sea. Alexander pushed even farther into Central Asia, South Asia, and Egypt. Roman colonization covered much of the same area and regions south to northern Africa, west to Spain, and

north to Britain and Germany. Reasons for colonizing included expansion of trade, acquisition of raw materials, resolution of political unrest or overpopulation, and craving for land and rewards. Colonies retained ties and loyalty to Rome, though rebelliousness was not uncommon. In Roman colonies after 177 bc, colonists retained Roman citizenship and could exercise full political rights. Ancient colonization spread Hellenic and Roman culture to the far reaches of the empires, often assimilating local populations, some of whom acquired Roman citizenship.

colony In zoology, a group of organisms of one species that live and interact closely with each other in an organized fashion. A colony differs from an aggregation, in which the group has no cooperative or organized function. Colonies of social insects (e.g., ants, bees) usually include castes with different responsibilities. Many birds form temporary breeding colonies, in some cases to stimulate reproductive activities, in others to make the best use of a limited breeding habitat and to coordinate efforts in protecting nests from predators. Certain mammals that live in close groups are said to be colonial, though they lack cooperative activities and each maintains a territory.

Colophon \'ka-l3-,fan\ Ancient Ionian Greek city, western Anatolia. Located 15 mi (25 km) northwest of the ancient city of Ephesus, it was a flourishing commercial city in the 8th-5th centuries bc, famous for its cavalry, its luxury, and its production of rosin. A member of the Delian League, during the Peloponnesian War it was controlled first by the Persian Achaemenian dynasty and then by Athens, and it was conquered in 302 bc by Macedonia under Alexander the Great. Only a few foundations of the old walled city are now visible.

Colorado Group of Indian people of Ecuador’s Pacific coast. In the tropical lowlands where the Colorado traditionally have lived, they and the neighbouring Cayapas are the last remaining aboriginal groups. The Colorado (Spanish: “red”), so named because of their use of red pigment to decorate their faces and bodies, have been fishermen, hunters, and shifting cultivators; some, however, have taken up work on plantations, and others have migrated to work in the city.

Colorado State (pop., 2000: 4,301,261), west-central U.S. Bordered by Wyoming, Nebraska, Kansas, Oklahoma, New Mexico, and Utah, it covers 104,100 sq mi (269,619 sq km); its capital is Denver. Lying astride the Rocky Mountains, the state has three physiographic regions: the plains, a semiarid segment of eastern Colorado; the Colorado Piedmont in the central part of the state, where most of the population lives; and the southern Rocky Mountains and mesas of western Colorado. Its large urban population has grown faster than the national average. Its original inhabitants were Plains and Great Basin Indians, including the Arapaho, Cheyenne, and Ute. The area was claimed by Spain in 1706 but later passed in large part to France. Eastern Colorado was part of the Louisiana Purchase in 1803; the remainder stayed in Spanish and, after independence, Mexican hands until 1848. Gold was discovered in 1859 and touched off a population boom. Organized as the territory of Colorado in 1861, it achieved U.S. statehood in 1876. Agriculture, cattle production, and mining, as well as manufacturing, are important to the economy. Government military installations and service industries have become prominent, and tourism is a major source of the state’s income (see Aspen; Boulder; Vail).

Colorado National Monument Natural area, western Colorado, U.S. Established in 1911, the 32-sq-mi (83-sq-km) scenic area is known for its colourful, wind-eroded sandstone formations, towering monoliths, and steep-walled canyons. Petrified logs and dinosaur fossils have been found in the area. Rim Rock Drive skirts the canyon walls, which rise more than 6,500 ft (1,980 m).

Colorado potato beetle or potato bug Leaf beetle (Leptinotarsa decemlineata, family Chrysomelidae) native to western North America. It began feeding on the leaves of cultivated potatoes when the plants were introduced into western North America, and by 1874 it had become an important and widespread pest. It has a hemispherical body, about 0.4 in. (10 mm) long, and is orange-red or yellow, with black stripes on the wing covers. Depending on climate, potato beetles may produce one to three generations each year.

Colorado River River, south-central Argentina. Its major headstreams, the Grande and Barrancas rivers, flow southward from the Andes Mountains and meet to form the Colorado near the Chilean border. It flows southeastward across northern Patagonia and the southern Pampas. Its lower course splits into two arms that flow into the Atlantic Ocean south of Bahia Blanca. Its total length is about 530 mi (850 km).

Colorado River River, western Texas, U.S. It flows southeast 862 mi (1,387 km) through prairie, hill, and canyon country past Austin and across the coastal plain to enter Matagorda Bay. The river, the largest entirely within Texas, is the site of flood-control, power, irrigation, and recreational projects.

Colorado River River, North America. Rising in the Rocky Mountains of Colorado, U.S., it flows west and south 1,450 mi (2,330 km) to empty into the Gulf of California in northwestern Mexico. It drains a vast sector of the North American continent, about 246,000 sq mi (637,000 sq km). No other river in the world has cut so many deep trenches, of which the Grand Canyon is the largest and most spectacular. It is important for hydroelectric power and irrigation; more than 20 dams, including Hoover Dam, have been built on the Colorado River and its tributaries.

Colorado Springs City (pop., 2000: 360,890), central Colorado, U.S. Standing on a mesa near the eastern base of Pikes Peak, it was founded in 1871 as Fountain Colony and later renamed for nearby mineral springs. Growth followed the Cripple Creek gold strikes in the 1890s. Military installations gave further impetus to development: it is home to the North American Aerospace Defense Command (NORAD) and the U.S. Space Command, headquartered at Peterson Air Force Base (established 1942); Fort Carson (1942); and the U.S. Air Force Academy (1958). The Garden of the Gods, a natural park with red sandstone monoliths, is one of many scenic attractions.

colorectal cancer Malignant tumour of the large intestine (colon) or rectum. Risk factors include age (after age 50), family history of colorectal cancer, chronic inflammatory bowel diseases, benign polyps, physical inactivity, and a diet high in fat. Many of the symptoms are associated with abnormal digestion and elimination. Colorectal cancer is treated by surgery, chemotherapy, or radiation therapy.

colorimetry ^ko-lo-'ri-mo-treV Measurement of the intensity of electromagnetic radiation in the visible spectrum transmitted through a solution or

transparent solid. It is used to identify and determine the concentrations of substances that absorb light of a specific wavelength or colour according to Lambert’s law, which relates the amount of light absorbed to the

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distance traveled through the absorbing medium, and Beer’s law, relating it to the concentration of absorbing substance in the coloured solution. A photocell is often used to measure the amount of light transmitted through a glass tube containing the solution to be analyzed; the result is compared with results from a similar tube containing solvent alone. Most elements and many compounds, in appropriately treated samples, may be identified by colorimetry or spectrophotometry, a closely related technique.

colossal order or giant order Architectural order in which the columns extend beyond one interior story, often through several stories.

Though giant columns were used in antiquity, they were first applied to building facades in Renaissance Italy. Any of the orders might be treated in this manner. The colossal order was revived in 18th-century Europe.

Colosseum Flavian Amphitheater in Rome, erected c. ad 70-82 under the emperors Vespasian and Titus. The name Colosseum was applied some time after the 8th century because of its immense size and capacity, holding some 50,000 people. Unlike earlier amphitheaters, which were nearly all dug into hillsides for extra support, the Colosseum is a free-standing oval colonnaded structure of stone and concrete. It was the scene of combats between gladiators, contests of men with animals, and even mock naval engagements. The Colosseum was damaged by lightning and earthquakes in medieval times and, even more severely, by vandals. A restoration project was undertaken in the 1990s, and in 2000 the Colosseum staged a series of plays that marked the first time in more than 1 ,500 years that live performances had been held there.

Colossus of Rhodes See Colossus of Rhodes

colostomy \ko-Tas-t3-me\ Surgical formation of an artificial anus by making an opening from the colon through the abdominal wall. It may

be done to decompress an obstructed colon, to allow excretion when part of the colon must be removed, or to permit healing of the colon. Colostomy may be temporary or permanent. A sigmoid colostomy, the most common type of permanent colostomy, requires no appliances (though a light pouch is sometimes worn for reassurance) and allows a normal life except for the route of fecal excretion. See also ostomy.

colour Aspect of any object that may be described in terms of hue, brightness, and saturation. It is associated with the visible wavelengths of electromagnetic radiation, which stimulate the sensor cells of the eye. Red light has the longest wavelengths, while blue has the shortest, with other colours such as orange, yellow, and green between. Hue refers to dominant wavelengths. Brightness refers to the intensity or degree of shading. Saturation pertains to purity, or the amount of white light mixed with a hue. The colours red, yellow, and blue, known as primary colours, can be combined in varying proportions to produce all other colours. Primary colours combined in equal proportions produce secondary colours. Two colours that combine to form white light are said to be complementary.

colour blindness Inability to distinguish one or more colours. The human retina contains three types of cone cells that absorb light in different parts of the spectrum. Absence of these types causes colour blindness to red, green, and blue. Colour blindness is a sex-linked recessive trait (see recessiveness) 20 times more common in men than in women.

colour index In igneous petrology, the sum of the volume percentages of the coloured, or dark, minerals in the rock. The most common light-coloured minerals are feldspars, feldspathoids, and silica or quartz; abundant dark-coloured minerals include olivine, pyroxene, amphibole, biotite, garnet, tourmaline, iron oxides, sulfides, and metals.

colour printing Specialized printing technique using coloured inks and modified presses. Juxtaposition of colours is achieved by submitting each sheet to successive impressions by typeforms each of which prints only

on areas designed to carry a single colour and inked only in that colour. Three colours of ink can reconstitute the visual effect of all the range of colours by combining them appropriately; if all three inks are applied to an area, it almost appears black. Standard colour printing, called four-colour printing, employs magenta, yellow, cyan (blue), and black inks.

Colt, Samuel (b. July 19, 1814, Hartford, Conn., U.S. — d. Jan. 10, 1862, Hartford) U.S. inventor. He worked in his father’s textile factory before going to sea in 1830. On a voyage to India he conceived the idea for his first revolver, which he later patented (1835-36). Colt’s six-shooters were slow to gain acceptance, and his company in Paterson, N.J., failed in 1842. He invented a naval mine with the first remotely controlled explosive in 1843 and conducted a telegraph business that used the first underwater cable. Soldiers’ favourable reports prompted an order for 1 ,000 pistols during the Mexican War, and Colt resumed manufacture in 1847. Assisted by Eli Whitney, Jr., he advanced the development of interchangeable parts and the assembly une. His firm, based in Hartford, produced the revolvers most widely used in the American Civil War and in the settlement of the West, including the famous Colt .45.

Colter, John (b. c. 1775, in or near Staunton, Va. — d. 1813, in present-day Missouri, U.S.) U.S. explorer. A member of the Lewis and Clark Expe-

dition (1803-06), in 1807 he was sent to make contact with Indian tribes in the Yellowstone River area; he became the first white man to see and describe the region. In three expeditions to the head of the Missouri River (1808-10), he narrowly escaped death in battles with Indians. He retired to a farm on the Missouri.

Colton, Gardner (Quincy) (b. Feb. 7, 1814, Georgia, Vt., U.S. — d. Aug. 9, 1898, Rotterdam, Neth.) U.S. anesthetist and inventor. He was among the first to use nitrous oxide as an anesthetic in dentistry; after a dentist suggested it, he safely used it in extracting thousands of teeth. He also invented an electric motor, exhibited in 1847.

Coltrane, John (William) (b. Sept. 23, 1926, Hamlet, N.C., U.S. — d. July 17, 1967, Huntington, N.Y.)

U.S. saxophonist and composer.

After growing up in Philadelphia, he gained early experience in the bands of Dizzy Gillespie and Johnny Hodges.

Associations with Miles Davis and Thelonious Monk in the 1950s established Coltrane’ s place in the vanguard of modem jazz, and his quartet of the early 1960s is one of the outstanding groups in jazz history. His style encompassed the modal jazz first explored with Davis, the complex chord structures of his own compositions, and ultimately the extremes of timbre, dynamics, and register associated with free jazz.

Coltrane ’s total mastery of the tenor and soprano saxophones, the rich harmonic density of his compositions, and his clear projection of emotion enabled him to reconcile technical virtuosity with an often spiritual profundity.

Columba, Saint or Colum or Columcille Vksl-om-.kiH (b. c. 521, Tyrconnell — d. June 8/9, 597, Iona; feast day June 9) Irish abbot and missionary. A member of the warrior aristocracy, he was excommunicated for his part in a bloody battle. Exiled, he set out to do penance as a missionary. He founded two famous monasteries in Ireland before taking 12 disciples to the Scottish island of Iona (c. 563), where they built a church and monastery that served as a base for the conversion of the Scottish Picts, and thereby Scotland, to Christianity.

Columban, Saint (b. c. 543, Leinster, Ireland — d. Nov. 23, 615, Bobbio, Italy; feast day November 23) Irish abbot and missionary. One of the greatest missionaries of the Celtic church, he initiated a revival of spirituality on the European continent. He left Ireland c. 590 with 12 monks, and the Merovingian king Guntram granted him land in the Vosges Mountains in Gaul, where he established several monasteries, including the great intellectual and religious house at Luxeuil. He was disciplined for keeping Easter according to the Celtic usage, and he ran afoul with the

Frankish clergy for his indictment of their moral laxity. He was forced

Colossal order, court facade of Blen-
heim Palace, Oxfordshire, England, by
Sir John Vanbrugh, begun 1 705

John Coltrane, 1 966.

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into exile for his criticism of the sins of the powerful queen Brunhild and her court and then moved into what is now Switzerland, where he preached to the Alemanni. He later settled in Italy and founded the monastery of Bobbio (c. 612), a centre of medieval culture known for its great library.

Columbia City (pop., 2000: 116,278), capital of South Carolina, U.S. Located in the centre of the state on the Congaree River, it dates from 1786, when a town was laid out to replace Charleston as the state capital. During the American Civil War, it was a transportation centre and the seat of many Confederate agencies; in 1865 it was occupied by Union troops and virtually destroyed by fire. Rebuilt after the war, it developed a diversified economy based on government, industry, and agriculture. Cotton, peaches, and tobacco are important crops in the surrounding area. It is the seat of the University of South Carolina.

Columbia Broadcasting System See CBS

Columbia Pictures Entertainment, Inc. Major U.S. film studio. It originated in 1920 when brothers Jack and Harry Cohn formed a company with Joe Brandt to produce short films and low-budget westerns. It became Columbia Pictures in 1924. Harry Cohn, who served as president and head of production from 1932 until his death in 1958, was the driving force behind its success. The studio produced the 1930s films of Frank Capra and many other successful films, including All the King’s Men (1949), From Here to Eternity (1953), Lawrence of Arabia (1962), Five Easy Pieces (1970), Close Encounters of the Third Kind (1977), and The Last Emperor (1987). After Columbia was purchased by the Coca-Cola C o. in 1982, it helped launch Tri-Star Pictures. The two studios merged in 1987 as Columbia Pictures Entertainment, which was bought by Sony Corp. in 1989.

Columbia River River, southwestern Canada and northwestern U.S. Rising in the Canadian Rockies, it flows through Washington state, entering the Pacific Ocean at Astoria, Ore.; it has a total length of 1,240 mi (2,000 km). It was a major transportation artery in the Pacific Northwest until the coming of the railroads. Development of the river began in the 1930s with construction of the Grand Coulee and Bonneville dams, and within 50 years the entire river within the U.S. had been converted into a series of “stair steps” by a total of 1 1 dams. Its many hydroelectric power plants are basic to the power-generating network of the Pacific Northwest.

Columbia University Private university in New York City, a traditional member of the Ivy League. Founded in 1754 as King’s College, it was renamed Columbia College when it reopened in 1784 after the American Revolution. It became Columbia University in 1912. Its liberal arts college began admitting women in 1983. Neighbouring Barnard College, founded in 1889 and part of the university since 1900, remains a women’s liberal arts school; most courses are open to students of both colleges. From the outset Columbia differed from other private Eastern universities in its emphasis on such subjects as nature study, commerce, history, and government. It has strong graduate programs in the arts and sciences and several notable research institutes. Among its professional schools are those of architecture, business, education (Teachers College, Columbia University), engineering, international and public affairs, journalism, law, medicine (including affiliations with Columbia-Presbyterian Medical Center and NewYork-Presbyterian Hospital), nursing, public health, and social work.

columbine Any of approximately 70 species of perennial herbaceous plants constituting the genus Aquilegia, in the buttercup family, native to Europe and North America. They are distinctive for their five-petaled flowers with long, backward-extending spurs. Sepals and petals are brightly coloured. A. caerulea and A. chysantha are native to the Rocky Mountains. The wild columbine of North America (A. canadensis), bearing red flowers with touches of yellow, grows in woods and on rocky ledges from southern Canada southward. Many garden hybrids are cultivated for their showy flowers.

Columbus, Christopher Italian Cristoforo Colombo Spanish Cristobal Colon (b. between Aug. 26 and Oct. 317, 1451, Genoa — d. May 20, 1506, Valladolid, Spain) Genoese navigator and explorer whose transatlantic voyages opened the way for European exploration, exploitation, and colonization of the Americas. He began his career as a young seaman in the Portuguese merchant marine. In 1492 he obtained the sponsorship of the Spanish monarchs Ferdinand II and Isabella I for an attempt to reach Asia by sailing westward over what was presumed to be open

sea. On his first voyage he set sail in August 1492 with three ships — the Santa Maria, the Nina, and the Pinta — and land was sighted in the Bahamas on October 12. He sailed along the northern coast of Hispaniola and returned to Spain in 1493. He made a second voyage (1493-96) with at least 17 ships and founded La Isabela (in what is now the Dominican Republic), the first European town in the New World. This voyage also began Spain’s effort to promote Christian evangelization. On his third voyage (1498-1500) he reached South America and the Orinoco River delta. Allegations of his poor administration led to his being returned to Spain in chains. On his fourth voyage (1502-04) he returned to South

America and sailed along the coasts of present-day Honduras and Panama. He was unable to attain his goals of nobility and great wealth. His character and achievements have long been debated, but scholars generally agree that he was an intrepid and brilliant navigator.

Columbus City (pop., 2000: 186,291), western Georgia, U.S. Located on the Chattahoochee River, it was founded in 1828 and by 1840 had become a leading inland cotton port with a thriving textile industry. During the American Civil War it was a major supply city for the Confederacy and the site of the last battle east of the Mississippi. Now highly industrialized, Columbus is one of the South’s largest textile centres. It is home to the National Civil War Naval Museum. Fort Benning (established 1918) is nearby.

Columbus City (pop., 2000: 711,470), capital of Ohio, U.S. Located at the junction of the Scioto and Olentangy rivers, the city was planned in 1812 as a political centre and sited opposite the original 1797 settlement of Franklinton; the state government moved to the city in 1816. The arrival of roads, canals, and rail in the mid 19th century led to significant growth, and by 1900 Columbus had emerged as an important transportation and commercial centre. It is Ohio’s largest city, and its economy is supported by industry, governmental agencies, and numerous educational and research institutions, including the Ohio State University.

Columbus Platform In Reform Judaism, a declaration issued by a conference of U.S. Reform rabbis meeting in Columbus, Ohio, in 1937. It supported the use of traditional ceremonies and Hebrew in the liturgy and reemphasized the idea of the Jewish people, a dramatic revision of the Reform principles stated in the Pittsburgh Platform (1885).

Columcille See St. Columba

column In architecture, a vertical element, usually a slender shaft, that provides structural support by carrying axial loads in compression; columns are also subject to buckling.

Columns may be exposed or hidden in walls; constructed of precast concrete, masonry, stone, or wood or of steel wide-flange, pipe, or tubular sections; they may be plain, fluted, or sculpted, with or without a capital and base. Columns may also be nonstructural, used for decorative or monumental purposes. See also inter-
COLUMN I ATION , ORDER.

coma Complete lack of consciousness, with loss of reaction to stimulus and of spontaneous nervous activity. It is usually associated with cerebral injury of metabolic or physical origin. Simple concussions cause short losses of consciousness. Coma from lack of oxygen may last several weeks and is often fatal. Coma caused by stroke can be sudden, while that caused by metabolic abnormalities (as in diabetes melutus) or cerebral tumours comes on gradually. Treatment depends on the cause.

Comana \k3-'ma-n9\ Ancient city in Cappadocia, eastern Anatolia.

Located on the Seyhan River in the Taurus Mountains, it was the centre of the cult of the mother goddess Ma-Enyo and the site of lavish celebrations. It was governed by a chief priest, usually a member of the reigning Cappadocian family, who ranked next to the king. A Roman colony in the 3rd century ad, it lay on the chief military road to the empire's eastern frontier.

Comanche \k9-'man-che\ Nomadic North American Indian group of southwest Oklahoma, Texas, California, and New Mexico, U.S. The name Comanche is derived from a Ute word meaning "anyone who wants to fight me all the time"; the people call themselves Numunuh (meaning

Doric columns on the Greek temple at Segesta, Sicily, c. 424-416 bc

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"The People"). Their language is of Uto-Aztecan stock. An offshoot of the Shoshone, they were organized into about 12 autonomous bands, local groups that lacked the lineages, clans, military societies, and tribal government of most other Plains Indians. They roamed the southern Great Plains in the 18th and 19th century. Their staple food was buffalo meat. Their highly skilled horsemen set the pattern of equestrian nomadism on the Plains. In 1864 Col. Kit Carson led U.S. forces in an unsuccessful campaign against them. Treaties were signed in 1865 and 1867, but the federal government failed to keep whites off the land promised to them, which led to violent conflicts. In later years Comanche Code-Talkers, like other Native American Code-Talkers, played a notable role during both world wars. Some 10,000 people claimed sole Comanche descent in the 2000 U.S. census.

Comaneci \,ko-m9- , ne-che\ / Nadia (b. Nov. 12, 1961, Gheorghe Gheorghiu-Dej, Rom.) Romanian-born gymnast. Comaneci entered her first international competition in 1972 and won three gold medals. In the 1976 Olympic Games, the first in which a perfect score of 10 was ever awarded in an Olympic gymnastic event, she received an astounding seven perfect scores and won the gold medals for the balance beam, uneven parallel bars, and all-around competitions. In the 1980 Olympics she won gold medals for the beam and the floor exercises. She retired from competition in 1984 and defected to the U.S. in 1989.

comb jelly See ctenophore

Combes \ko n b\, (Justin-Louis-) Emile (b. Sept. 6, 1835, Roquecourbe, France — d. May 25, 1921, Pons) French politician. He became mayor of Pons in 1875 and was elected to the Senate in 1885 as a member of the anticlerical Radical Party. As premier (1902-05), he presided

over the separation of church and state in the wake of the Alfred Dreyfus affair. He agreed to laws exiling almost all religious orders from France and dismantling major aspects of the church's public functions, especially in education. Admired by many republicans, he later served as minister without portfolio (1915), despite his advanced age.

combination See permutations and combinations

Combination Acts British acts of 1799 and 1800 that outlawed trade unions. The laws made it illegal for any workingman to combine with another to gain an increase in wages or a decrease in hours, to solicit anyone else to leave work, or to object to working with any other workman. They were repealed in 1824 through the efforts of the radical reformer Francis Place (1771-1854).

combinatorics V.kam-bo-no-'tor-iksV Branch of mathematics concerned with the selection, arrangement, and combination of objects chosen from a finite set. The number of possible bridge hands is a simple example; more complex problems include scheduling classes in classrooms at a large university and designing a routing system for telephone signals. No standard algebraic procedures apply to all combinatorial problems; a separate logical analysis may be required for each problem. Combinatorics has its roots in antiquity, but new uses in computer science and systems management have increased its importance in recent years. See also permutations AND COMBINATIONS.

combine harvester Farm machine used, mainly in developed countries, to harvest wheat and often other cereals. The mechanical ancestor of today's large combines was Cyrus H. McCormick's reaper, introduced in 1831. Threshing machines were powered first by men or animals, often using treadmills, later by steam engines and internal-combustion engines. The modern combine harvester, originally introduced in California c. 1875, came into wide use in the U.S. in the 1920s and '30s and in Britain in the 1940s. The self-propelled combine was introduced in 1940. The combine cuts the standing grain, threshes out the grain from the straw and chaff, cleans the grain, and empties it into bags or grain-storage facilities. It has greatly reduced harvesting time and labour; whereas in 1829 harvesting an acre of wheat required 14 man-hours, the modem combine requires less than 30 minutes.

combining weight See equivalent weight

Comden, Betty orig. Elizabeth Cohen (b. May 3, 1919, Brooklyn, N.Y., U.S.) U.S. musical-comedy writer and lyricist. Comden formed a nightclub act in 1938 with Adolph Green (b. Dec. 2, 1915, Bronx, N.Y. — d. Oct. 23, 2002, New York, N.Y.), Judy Holliday (1922-65), and others. In 1944 Comden and Green wrote the book and lyrics for Leonard Bernstein's On the Town. They later collaborated with Jule Styne on musicals such as Peter Pan (1954), Bells Are Ringing (1956), and Hallelujah, Baby! (1967, Tony Award). Their lyrics for Wonderful Town (1953), Applause (1970), and On the 20th Century (1978) won them three more Tony Awards. Their screenplays include Singin' in the Rain (1952) and Auntie Mame (1958). "Just in Time" and "The Party's Over" are two of their best-known songs.

Comecon See Council for Mutual Economic Assistance

Comedie-Francaise yko-ma-'de-frau-'sezN National theatre of France. The world’s longest-established national theatre, it was founded in 1680 by the merger of two theatrical companies in Paris, one of them the troupe that had worked under Moliere. The French Revolution divided the company’s loyalties, and the revolution’s supporters, led by Francois-Joseph Talma, moved to the theatre’s present home in 1791. The company was reconstituted in 1803. Under its rules of organization, established by Napoleon in 1812, its members share responsibilities and profits. Its illustrious actors have included Sarah Bernhardt and Jean- Louis Barrault. The theatre is known for productions of the French classics, though it also performs contemporary plays.

comedy Genre of dramatic literature that deals with the light and amusing or with the serious and profound in a light, familiar, or satirical manner. Comedy can be traced to revels associated with worship in Greece in the 5th century bc. Aristophanes, Menander, Terence, and Plautus produced comedies in classical literature. It reappeared in the late Middle Ages, when the term was used to mean simply a story with a happy ending (e.g., Dante’s Divine Comedy), the same meaning it has in novels of the last three centuries (e.g., the fiction of Jane Austen). Compare tragedy.

comedy of manners Witty, ironic form of drama that satirizes the manners and fashions of a particular social class or set. Comedies of manners were usually written by sophisticated authors for members of their own social class, and they typically are concerned with social usage and the ability or inability of certain characters to meet social standards, which are often exacting but morally trivial. The plot, usually concerning an illicit love affair or other scandalous matter, is subordinate to the play’s brittle atmosphere, witty dialogue, and pungent commentary on human foibles. Its notable exponents include William Congreve, Oliver Goldsmith, Richard Brinsley Sheridan, Oscar Wilde, and Noel Coward.

Comenius \k3-'me-ne-os\, John Amos Czech Jan Amos Komen-

sky (b. March 28, 1592, Nivnice, Moravia — d. Nov. 15, 1670, Amsterdam, Neth.) Czech educational reformer and religious leader. He favoured the learning of Latin to facilitate the study of European culture but emphasized learning about things rather than about grammar per se. His Janua Linguarum Reserata (1631), a textbook that described useful facts about the world in both Latin and Czech, revolutionized Latin teaching and was translated into 16 languages. He also produced one of the first illustrated schoolbooks, Orbis Sensualium Pictus (1658).

comet Any of a class of small icy objects orbiting the Sun and developing diffuse gaseous envelopes and often long glowing tails when near the Sun. They are distinguished from other objects in the solar system by their composition, hazy appearance, and elongated orbits. Most comets originate in the Oort cloud or in the Kuiper belt. Other bodies’ gravity can alter their orbits, causing them to pass close to the Sun. Short-period comets return in 200 years or less, others in thousands of years or not at all. A comet typically consists of a small, irregular nucleus, often described as a “dirty snowball,” with dust and other materials frozen in water mixed with volatile compounds. When one nears the Sun, the heat vaporizes its surface, releasing gases and dust particles, which form a cloud (coma) around the nucleus. Material in the coma may be pushed away from the Sun by its radiation and the solar wind, forming one or more tails. Meteor showers occur when Earth passes through dust left by

the passage of a comet.

comfrey Vkom-freV Any herb of the Eurasian genus Symphytum (borage family). Best known is the medicinal common comfrey (S. officinale), used to treat wounds and as a source of a gum used to treat wool. Traditionally it was also taken internally for various complaints. Organic farmers use it to deter slugs and as a green manure. The coiled sprays of bell-like, hanging comfrey blooms are usually pollinated by bees. Common comfrey is about 3 ft (90 cm) tall, with winged, hairy stems and blue, purplish, or yellow flowers.

comic book Bound collection of comic strips, usually in chronological sequence, typically telling a single story or a series of different stories.

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The first true comic books were marketed in 1933 as giveaway advertising premiums. By 1935 reprints of newspaper strips and books with original stories were selling in large quantities. During World War II comics dealing with war and crime found many readers among soldiers stationed abroad, and in the 1950s comic books were blamed for juvenile delinquency. Though the industry responded with self-censorship, some adventure strips continued to be criticized. In the 1960s comic books satirizing the cultural underworld became popular, especially among college students, and comic books have been used to deal with serious subjects (e.g., Art Spiegelman’s Maus books, about the Holocaust). Japanese comic books (manga), with their great variation in content and affect, have achieved wide popularity. Today comic “’zines” represent a thriving subculture.

comic strip Series of drawings that read as a narrative, arranged together on the page of a newspaper, magazine, or book. In the 1890s several U.S. newspapers featured weekly drawings that were funny, but without indicated speech. In 1897 Rudolph Dirks’s Katzenjammer Kids, in the New York Journal, featured humorous strips containing words presumably spoken by the characters. Soon speeches in balloons appeared in other cartoons, arranged in a series to form a strip. The comic strip arrived at its maturity in 1907 with Bud Fisher’s Mutt and Jeff, which appeared daily in the San Francisco Chronicle. Important later comic-strip artists include George Herriman, Al Capp, Walt Kelly, and Charles Schulz. See also comic book.

Cominform in full Communist Information Bureau Agency of international communism founded under Soviet auspices in 1947. Its original members were the Communist Parties of the Soviet Union, Bulgaria, Czechoslovakia, Hungary, Poland, Romania, Yugoslavia, France, and Italy, but Yugoslavia was expelled in 1948. The Cominform’ s activities consisted mainly of publishing propaganda to encourage international communist solidarity. It was dissolved by Soviet initiative in 1956 as part of a Soviet program of reconciliation with Yugoslavia.

Comintern or Communist International or Third International Association of national communist parties founded in 1919. Vladimir Ilich Lenin called the first congress of the Comintern to undermine efforts to revive the Second International. To join, parties were required to model their structure in conformity with the Soviet pattern and to expel moderate socialists and pacifists. Though the Comintern's stated purpose was the promotion of world revolution, it functioned chiefly as an organ of Soviet control over the international communist movement. In 1943, during World War II, Joseph Stalin dissolved the Comintern to allay fears of communist subversion among his allies.

Comitia Centuriata Nko-'mish-o-.sen-.tur-e-'a-toV Ancient Roman military assembly, instituted c. 450 bc. It decided on war and peace, passed laws, elected consuls, praetors, and censors, and considered appeals of capital convictions. Unlike the older patrician Comitia Curiata, it included plebeians as well as patricians, assigned to classes and centuriae (centuries, or groups of 100) by wealth and the equipment they could provide for military duty. Voting started with the wealthier centuries, whose votes outweighed those of the poorer.

command economy Economic system in which the means of production are publicly owned and economic activity is controlled by a central authority. Central planners determine the assortment of goods to be produced, allocate raw materials, fix quotas for each enterprise, and set prices. Most communist countries have had command economies; capitalist countries may also adopt such a system during national emergencies (e.g., wartime) in order to mobilize resources quickly. See also capitalism; communism.

commando In British military forces, a unit consisting of marines and soldiers organized for rapid deployment and trained to conduct special operations. The commando originated with the Boers in South Africa, where it was the administrative and tactical unit "commandeered" by law. In World War II the British adopted the term for a new specially trained amphibious raiding force. Modern commandos are units of the Royal Marines with support troops from the British Army; by extension a member of such a unit is also called a commando and is entitled to wear a green beret.

commedia dell'arte \k6m-'mad-ya-del-Tar-ta\ Italian theatrical form that flourished throughout Europe in the 16th– 18th centuries. The characters, many portrayed by actors wearing masks – including the witty gentleman's valet Harlequin, the Venetian merchant Pantelone, the honest and simpleminded servant Pierrot, the maidservant Columbina, the unscrupulous servant Scaramouche, and the braggart captain or Capitano – were derived from the exaggeration or parody of regional or stock fictional types. The style emphasized improvisation within a framework of conventionalized masks and stock situations. It was acted by professional companies using vernacular dialects and plenty of comic action; the first known commedia dell'arte troupe was formed in 1545. Outside Italy it had its greatest success in France as the Comedie-Italienne; in England, it was adapted in the harlequinade and the Punch-and-Judy show (see Punch). See also Andreini family.

commerce clause In the Constitution of the United States (Article I,

section 8), the clause that authorizes Congress “To regulate Commerce with foreign Nations, and among the several States, and with Indian Tribes.” It is the legal foundation of much of the U.S. government’s regulatory authority. See also interstate commerce.

commercial bank Bank that makes loans to businesses, consumers, and nonbusiness institutions. Early commercial banks were limited to accepting deposits of money or valuables for safekeeping and verifying coinage or exchanging one jurisdiction’s coins for another’s. By the 17th century most of the essentials of modern banking, including foreign exchange, the payment of interest, and the granting of loans, were in place. It became common for individuals and firms to exchange funds through bankers with a written draft, the precursor to the modern check. Because a commercial bank is required to hold only a fraction of its deposits as cash reserves, it can use some of the money deposited by its customers to extend loans. Commercial banks also offer a range of other services, including savings accounts, safe-deposit boxes, and trust services. See also bank; central bank; investment bank; savings bank.

commercial law See business law

Commercial Revolution Great increase in commerce in Europe that began in the late Middle Ages. It received stimulus from the voyages of exploration undertaken by England, Spain, and other nations to Africa, Asia, and the New World. Among the features associated with it were a surge in overseas trade, the appearance of the chartered company, acceptance of the principles of mercantilism, the creation of a money economy, increased economic specialization, and the establishment of such new institutions as the state bank, the bourse, and the futures market. The Commercial Revolution helped set the stage for the Industrial Revolution.

Committee for the Defense of Legitimate Rights Arabic Lajnat al-Difa' ‘an al-Huquq al-Shar'iyyah Sunnite Muslim group opposed to the ruling Saud dynasty in Saudi Arabia. The group was founded in 1992 and consists largely of academics and lower-level Muslim clergy. It considers itself a pressure group for peaceful reform and for improving human rights in Saudi Arabia but also agitates against what it perceives as the political corruption of the Saudi government and ruling family. Its leader is a former physics professor, Muhammad ibn al-Masa'arl. In 1994, after experiencing government repression, the group moved its headquarters to London. Despite its claim to advocate peaceful change, the group has been accused of aiding Islamic militants seeking to overthrow the Saudi government.

Committee of Public Safety Political body of the French Revolution that controlled France during the Reign of Terror. It was set up in April 1793 to defend France against its enemies, foreign and domestic. At first it was dominated by Georges Danton and his followers, but they were soon replaced by the radical Jacobins, including Maximilien Robespierre. Harsh measures were taken against alleged enemies of the Revolution, the economy was placed on a wartime basis, and mass conscription was undertaken. Dissension within the committee contributed to the downfall of Robespierre in July 1794, after which it declined in importance.

Committees of Correspondence Groups appointed by the legislatures of all 13 American colonies to provide a means of intercolonial communication. The first standing group was formed by Samuel Adams in Boston (1772), and within three months 80 others were formed in Mas-

sachusetts. In 1773 Virginia organized a committee with 11 members, including Thomas Jefferson and Patrick Henry. The committees were instrumental in promoting colonial unity and in summoning the First Continental Congress in 1774.

commode Piece of furniture resembling the English chest of drawers, used in France from the late 17th century. Most had marble tops, and some

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were fitted with pairs of doors. Andre-Charles Boulle was among the first to make commodes, which were heavy in form and elaborately decorated in marquetry veneers and ormolu. In the Louis XV period (1715-74), extravagant curves and flamboyant surface ornament became fashionable. The 19th-century commode lost its decorative features and became purely functional.

commodity exchange Organized market for the purchase and sale of enforceable contracts to deliver a commodity (such as wheat, gold, or cotton) or a financial instrument (such as U.S. treasury bills) at some future date. Such contracts are known as futures and are bought and sold in a competitive auction process on commodity exchanges (also called futures markets). The largest futures and futures-options exchange is the Chicago Board of Trade.

Commodus in full Caesar Marcus Aurelius Commodus Antoninus Augustus orig.

Lucius Aelius Aurelius Commodus (b. Aug. 31, 161, Lanuvium, Latium — d. Dec. 31, 192)

Roman emperor (ad 177-92). He ruled with his father, Marcus Aurelius, until the latter’s death in 180; recalled from the frontier, Commodus plunged into a life of dissipation in Rome. After his sister tried to have him killed (182), he executed the senators involved and began ruling capriciously. His brutality stirred unrest that ended years of Roman stability and prosperity. He renamed Rome Colonia Commodiana (“Colony of Commodus”). Physically impressive, he claimed he was Hercules and performed as a gladiator. His mistress and advisers had him strangled, ending the Antonine dynasty.

common cold See common cold

common fox See red fox
common gallinule See moorhen

common law Body of law based on custom and general principles and that, embodied in case law, serves as precedent or is applied to situations not covered by statute. Under the common-law system, when a court decides and reports its decision concerning a particular case, the case becomes part of the body of law and can be used in later cases involving similar matters. This use of precedents is known as stare decisis. Common law has been administered in the courts of England since the Middle Ages; it is also found in the U.S. and in most of the British Commonwealth. It is distinguished from civil law.

common-law marriage Marriage that is without a civil or religious ceremony and is based on the parties' agreement to consider themselves married and usually also on their cohabitation for a period of time. Most jurisdictions no longer allow this type of marriage to be formed, though they may recognize such marriages formed before a certain date or formed in a jurisdiction that permits such marriages.

common-lead dating See uranium-thorium-lead dating
Common Market See European Economic Community

Common Pleas, Court of English court of law founded in 1178 to hear civil disputes. Under the Magna Carta (1215), it attained jurisdiction separate from the King's (Queen's) Court, though its decisions were subject to review by the latter. Beginning in the 15th century, it competed with the King's (Queen's) Court and the Court of Exchequer for common-law business. By the 19th century, the complexity of overlapping jurisdictional rules had become unbearable, and all three courts were replaced (under the Judicature Act of 1873) by the Supreme Court of Judicature, which remains the court of general jurisdiction in England and Wales.

Common Prayer, Book of See Book of Common Prayer

common rorqual See fin whale

Commoner, Barry (b. May 28, 1917, Brooklyn, N.Y.) U.S. biologist and educator. He studied at Harvard University and taught at Washington University and Queens College. His warnings, since the 1950s, of the environmental threats posed by modern technology (including nuclear weapons, use of pesticides and other toxic chemicals, and ineffective waste management) in such works as his classic Science and Survival (1966) made him one of the foremost environmentalist spokesmen of his time. He was a third-party candidate for U.S. president in 1980.

Commons, House of Popularly elected lower house of the bicameral British Parliament. Passage of legislation is its primary function. Because it alone has the power to levy taxes and allocate expenditures, it is Britain's chief legislative authority. It originated in the late 13th century, when landholders and other property owners began sending representatives to Parliament to present grievances and petitions to the king and to accept commitments to the payment of taxes. It was the less powerful house until 1911, when the Reform Bill of that year gave it the power to override the House of Lords. The party with the greatest representation in the Com-

mons forms the government, and the prime minister chooses the cabinet from the party's members. There are 646 members, elected from single-member districts. See also Canadian Parliament; parliamentary democracy.

Commons, John R(ogers) (b. Oct. 13, 1862, Hollandsburg, Ohio, U.S. — d. May 11, 1945, Fort Lauderdale, Fla.) U.S. economist. He taught at the University of Wisconsin (1904-32) and published works such as A Documentary History of American Industrial Society (10 vol., 1910-11) and A History of Labor in the United States (4 vol., 1918-35), in which he linked the evolution of the U.S. labour movement to changes in the market structure. He drafted reform legislation for Wisconsin and worked for the federal government in areas including civil service and worker's compensation.

commonwealth Body politic founded on law for the common "weal," or good. The term was often used by 17th-century writers to signify an organized political community, its meaning thus being similar to the modern meaning of state or nation. Today it primarily refers to the Commonwealth. Four U.S. states (Kentucky, Massachusetts, Pennsylvania, and Virginia) call themselves commonwealths, a distinction in name only. Puerto Rico has been a commonwealth rather than a state since 1952; its residents, though U.S. citizens, have only a nonvoting representative in Congress and pay no federal taxes.

Commonwealth or Commonwealth of Nations Free association of sovereign states consisting of Britain and many of its former dependencies who have chosen to maintain ties of friendship and cooperation. It was established in 1931 by the Statute of Westminster as the British Commonwealth of Nations. Later its name was changed and it was redefined to include independent nations. Most of the dependent states that gained independence after 1947 chose Commonwealth membership. The British monarch serves as its symbolic head, and meetings of the more than 50 Commonwealth heads of government take place every two years. See also British empire.

Commonwealth Games Quadrennial sports competition for countries of the British Commonwealth. The inaugural meeting was called the British Empire Games and was held in Hamilton, Ont., Can., in 1930. The Games include athletics (track and field), gymnastics, bowls, and swimming events for both men and women, and boxing, cycling, shooting, weight lifting, and wrestling for men only. Rowing, badminton, and fencing have also occasionally been included.

Commonwealth of Independent States Free association of sovereign states formed in 1991, comprising Russia and 11 other republics that were formerly part of the Soviet Union. Members are Russia, Ukraine, Belarus, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, Armenia, Azerbaijan, Georgia, and Moldova. Its administrative center is in Minsk, Belarus. The Commonwealth's functions are to coordinate its members' policies regarding their economies, foreign relations, defense, immigration policies, environmental protection, and law enforcement.

commune \,kam-,yun, ko-'myunX Group of people living together who hold property in common and live according to a set of principles usually arrived at or endorsed by the group. The utopian socialism of Robert Dale Owen and others led to experimental communities of this sort in the early 19th century in Britain and the U.S., including New Harmony, Brook

Farm, and the Oneida Community. Many communes are inspired by reli-

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gious principles; monastic life is essentially communal (see monasticism). B. F. Skinner’s Walden Two (1948) inspired many American attempts at communal living, especially in the late 1960s and early 1970s. See also COLLECTIVE FARM, COMMUNITARIANISM, KIBBUTZ, MOSHAV.

commune Vkam-.yiin, ko-'myiinX In medieval European history, a town that acquired self-governing municipal institutions. Most such towns were defined by an oath binding the citizens or burghers of the town to mutual protection and assistance. The group became an association able to own property, make agreements, exercise jurisdiction over members, and exercise governmental powers. Communes were particularly strong in northern and central Italy, where the lack of a powerful central government allowed them to develop into independent city-states. Those of France and Germany were more often limited to local government.

Commune of Paris See Paris Commune

communication theory or information theory Field of mathematics that studies the problems of signal transmission, reception, and processing. It stems from Claude E. Shannon’s mathematical methods for measuring the degree of order (nonrandomness) in a signal, which drew largely on probability theory and stochastic processes and led to techniques for determining a source’s rate of information production, a channel’s capacity to handle information, and the average amount of information in a given type of message. Crucial to the design of communications systems, these techniques have important applications in linguistics, psychology, and even literary theory.

communications satellite Earth-orbiting system capable of receiving a signal (e.g., data, voice, TV) and relaying it back to the ground. Communications satellites have been a significant part of domestic and global communications since the 1970s. Typically they move in geosynchronous orbits about 22,300 mi (35,900 km) above the earth and operate at frequencies near 4 gigahertz (GHz) for downlinking and 6 GHz for uplinking.

The satellite's solar panels are arrays of solar cells that provide the electrical ener needed for its functions, the power being stored in batteries. Its antennas may be 8 ft (2.5 m) in diameter and may transmit wide-area-of-coverage beams or narrowly focused "spot" beams.

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communism Political theory advocating community ownership of all property, the benefits of which are to be shared by all according to the needs of each. The theory was principally the work of Karl Marx and Friedrich Engels. Their "Communist Manifesto" (1848) further specified a “dictatorship of the proletariat,” a transitional stage Marx called socialism; communism was the final stage in which not only class division but even the organized state — seen by Marx as inevitably an instrument of oppression — would be transcended (see Marxism). That distinction was soon lost, and “communist” began to apply to a specific party rather than a final goal. Vladimir Iuch Lenin maintained that the proletariat needed professional revolutionaries to guide it (see Leninism). Joseph Stalin’s version of communism (see Stalinism) was synonymous to many with totalitarianism. Mao Zedong mobilized peasants rather than an urban proletariat in China’s communist revolution (see Maoism). European communism (see Eurocommunism) lost most of its following with the collapse of the Soviet Union (1991). See also Communist Party, dialectical materiausm, First International, Second International.

Communism Peak See Imeni Ismael Samani Peak

Communist Information Bureau See Cominform

Communist International See Comintern

Communist Manifesto Pamphlet written in 1848 by Karl Marx and Friedrich Engels to serve as the platform of the Communist League. It argued that industrialization had exacerbated the divide between the capitalist ruling class and the proletariat, which had become impoverished, and called on the proletariat to overthrow the capitalists, abolish private property, and take over the means of production. It predicted an eventual classless society and the gradual elimination of the need for a state. It ends by stating, “The proletarians have nothing to lose but their chains. They have a world to win. Workingmen of all countries, unite.”

Communist Party Political party organized to facilitate the transition of society from capitalism through socialism to communism. Russia was the first country in which communists came to power (1917). In 1918 the Bolshevik party was renamed the All-Russian Communist Party; the name was taken to distinguish its members from the socialists of the Second International who had supported capitalist governments during World War I. Its basic unit was the workers’ council (soviet), above which were district, city, regional, and republic committees. At the top was the party congress, which met only every few years; the delegates elected the members of the Central Committee, who in turn elected the members of the Politburo and the Secretariat, though those organizations were actually largely self-perpetuating. The Soviet Union dominated communist parties worldwide through World War II. Yugoslavia challenged that hegemony in 1948 and China went its own way in the 1950s and ’60s. Communist parties have survived the demise of the Soviet Union (1991), but with reduced political influence. Cuba’s party remains in control, as does a hereditary communist party in North Korea.

Communist Party of the Soviet Union (CPSU) Major political party of Russia and the Soviet Union from the Russian Revolution of 1917 to 1991. It arose from the Bolshevik wing of the Russian Social- Democratic Workers' Party. From 1918 through the 1980s it was a monolithic, monopolistic ruling party that dominated the Soviet Union’s political,

economic, social, and cultural life. The constitution and other legal documents that supposedly regulated the government were actually subordinate to the CPSU, which also dominated the Comintern and the Cominform. Mikhail Gorbachev’s efforts to reform the country’s economy and political structure weakened the party, and in 1990 it voted to surrender its constitutionally guaranteed monopoly of power. The Soviet Union’s dissolution in 1991 marked the party’s formal demise.

communitarianism Political and social philosophy that emphasizes the importance of community in the functioning of political life, in the analysis and evaluation of political institutions, and in understanding human identity and well-being. It was developed in the 1980s and ’90s in explicit opposition to the theoretical liberalism of thinkers such as John Rawls. According to communitarians, liberalism relies on a conception of the individual that is unrealistically atomistic and abstract; it also places too much importance on individual values such as freedom and autonomy. Its chief representatives include Amitai Etzioni, Michael Sandel, and Charles Taylor. See also collectivism.

community centre See settlement house

community college See junior college

Community of Christ formerly Reorganized Church of Jesus Christ of Latter Day Saints Faction of the religion founded by Joseph Smith in 1830, whose main body became the Church of Jesus Christ of Latter-day Saints, or Mormon church. The sect, originally known as the Reorganized Church of Jesus Christ of Latter Day Saints, broke away in 1852, rejecting the leadership of Brigham Young in favour of Smith’s son; it also rejected the practice of polygamy and the label Mormon. Its teachings are based on the Bible, the Book of Mormon, and the Doctrine and Covenants, a book of revelations received by its prophets. In 2001 the church formally changed its name to Community of Christ. In the early 21st century it had about 250,000 members and was headquartered in Independence, Mo.

community property Property held jointly by a husband and wife. In states having a community property system, property acquired by either spouse during the marriage may be deemed to belong to each spouse as an undivided one-half interest. Some property (e.g., gifts to one spouse) may be classified as separate, but in lawsuits over the classification of property the presumption is in favour of the community category. Some jurisdictions extend community property laws to same-sex unions.

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commutative law Two closely related laws of number operations. In symbols, they are stated: a + b = b + a and ab = ba. Stated in words: Quantities to be added or multiplied can be combined in any order. More generally, if two procedures give the same result when carried out in arbi-

trary order, they are commutative. Exceptions occur (e.g., in vector multiplication). See also associative law, distributive law.

Commynes \ko-'men\, Philippe de (b. c. 1447, Comines, Flanders — d. Oct. 18, 1 5 1 1 , Argenton-Chateau, Fr.) Statesman and chronicler. Brought up in the Burgundian court, he was counselor to Charles the Bold (1467-72) and then to Charles's former enemy Louis XI. He was implicated in the "Mad War" between Anne of Beaujeu, regent of France, and the duke of Orleans (later Louis XII). He was briefly imprisoned but restored to favour in 1489 by Charles VIII and later helped formulate Louis XII' s Italian policy. His Memoires (1524-28) is an eyewitness account of events that reveals much about the era and its political intrigues.

Como, Lake ancient Lacus Larius Lake, Lombardy, northern Italy. It lies at an elevation of 653 ft (199 m) in a depression surrounded by limestone and granite mountains. It is 29 mi (47 km) long and up to 2.5 mi (4 km) wide, with an area of 56 sq mi (146 sq km) and a maximum depth of 1,358 ft (414 m). Famous for its natural beauty, its shores have many resorts.

Comoros Vka-ms-.rozV officially Union of the Comoros Island country, western Indian Ocean. Area: 719 sq mi (1,862 sq km). Population (2005 est.): 614,000. Capital: Moroni. The people are a mixture of

GRANDE COMORE ISLAND
Mbeni

L Moroni

INDIAN OCEAN

* Mount Karthala
7, 746 ft.

Foumbouni

mohEli ISLAND

ANJOUAN ISLAND

Mutsamudu

pm

Moya*

Niouachoua

Mozambique Channel

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Malay immigrants, Arab traders, and peoples from Madagascar and continental Africa. Languages: Comorian (a Bantu language), Arabic, French (all official).

Religion: Islam (official; predominantly

Sunni). Currency: Comorian franc. Comoros comprises a group of islands between Madagascar and the eastern African mainland that includes Njazidja (Grande Comore), Mwali (Moheli), and Nzwani (Anjouan) but excludes Mayotte. They are generally rocky, with shallow soils and poor harbours, though Mwali, the smallest, has fertile valleys and forested hillsides. Mount Karthala, an active volcano, is the highest point, at 7,746 ft (2,361 m). The climate is tropical. One of the world's poorest nations, Comoros has an economy based on subsistence agriculture. It is an Islamic republic with one legislative house. The head of state and government is the president, assisted by vice presidents. Known to European navigators since the 16th century, the dominant influence on the islands was then and for long afterward Arab. In 1843 France officially took possession of Mayotte and in 1886 placed the other three islands under protection. Sub-

ordinated to Madagascar in 1912, the Comoros became an overseas territory of France in 1947. In 1961 they were granted internal autonomy. In 1974 majorities on three of the islands voted for independence, which was declared in 1975. The following decade saw several coup attempts, culminating in the assassination of the president in 1989. French intervention permitted multiparty elections in 1990, but the country remained in a state of chronic instability, including secessionist movements on Nzwani and Mwali. In 1999 the army took control of the government and negotiated a constitution that took effect in 2002.

compact disc (CD) Molded plastic disc containing digital data that is scanned by a laser beam for the reproduction of recorded sound or other information. Since its commercial introduction in 1982, the audio CD has become the dominant format for high-fidelity recorded music. Digital audio data can be converted to analog form to reproduce the original audio signal (see digital-to-analog conversion). Coinvented by Philips Electronics and Sony Corp. in 1980, the compact disc has expanded beyond audio recordings into other storage-and-distribution uses, notably for computers (CD-ROM) and entertainment systems (videodisc and DVD). An audio CD can store just over an hour of music. A CD-ROM can contain up to 680 megabytes of computer data. A DVD, the same size as traditional CDs, is able to store up to 17 gigabytes of data, such as high-definition digital video files.

Companions of the Prophet Arabic Sahaba or Ashab Followers of Muhammad who had personal contact with him, including any Muslim contemporary who saw him. As eyewitnesses, they are the most important sources of HadIth. Sunnite Muslims regard the first four caliphs (among the 10 Companions to whom Muhammad promised paradise) as the most important. ShCite Muslims disregard the Companions, whom they

consider responsible for the loss of the caliphate by the family of 'All

comparative advantage Economic theory first advanced by Robert Torrens and David Ricardo that analyzes international trade in terms of differences in relative opportunity costs. The theory suggests that countries should specialize in the goods they can produce most efficiently rather than trying for self-sufficiency and argues strongly in favour of free international trade.

comparative psychology Study of similarities and differences in behavioral organization among living beings. The discipline pays particular attention to the psychological nature of humans in comparison with other animals. It began to emerge in the late 19th century and grew rapidly in the 20th century, involving experimental studies on human and animal brain function, learning, and motivation. Well-known studies have included those of Ivan Pavlov on conditioning in laboratory dogs, those of Harry Harlow (1905-81) on the effects of social deprivation in monkeys, and those of various researchers on language abilities in apes.

comparator Vkom-'par-o-torV Instrument for comparing something with a similar thing or with a standard measure, in particular to measure small displacements in mechanical devices. In astronomy, the blink comparator is used to examine photographic plates for signs of moving bodies. Machinists use comparators or visual gauges to centre or align work in MACHINE TOOLS.

compass In navigation or surveying, the chief device for direction finding on the Earth’s surface. Compasses may operate on magnetic or gyroscopic (see gyroscope) principles or by determining the direction of the Sun or a star. The oldest and most familiar type is the magnetic compass, used in different forms in aircraft, ships, and land vehicles and by surveyors. Magnetic compasses work as they do because the Earth itself is a magnet with a north-south field (see geomagnetic field) that causes freely moving magnets to align themselves with the field.

compatibilism Thesis that free will, in the sense required for moral responsibility, is consistent with universal causal determinism. It is important to distinguish the question of the logical consistency of belief in universal causal determinism with belief in free will from the question whether the thesis of free will (or that of causal determinism) is true. Compatibilists need not assert (though many have) the reality both of free will and of causal determinism. Among incompatibilists, some maintain the existence of free will and accordingly deny universal causal determinism, while others uphold universal causal determinism and deny the existence of free will. See also free will problem.

compiler Computer software that translates (compiles) source code written in a high-level language (e.g., C++) into a set of machine-language

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instructions that can be understood by a digital computer’s CPU. Compilers are very large programs, with error-checking and other abilities. Some compilers translate high-level language into an intermediate assembly language, which is then translated (assembled) into machine code by an assembly program or assembler. Other compilers generate machine language directly.

complement In physiology, a complex system of at least 20 proteins (complement components) in normal blood serum. The binding of one component to an antigen-antibody complex begins a chemical chain reaction important in many immunological processes, including breakdown of foreign and infected cells, ingestion of foreign particles and cell debris, and inflammation of surrounding tissue. Complement components and antibodies are the substances in human serum responsible for killing bacteria.

complementary medicine See alternative medicine

completeness Concept of the adequacy of a formal system that is employed both in proof theory and in model theory (see logic). In proof theory, a formal system is said to be syntactically complete if and only if every closed sentence in the system is such that either it or its negation is provable in the system. In model theory, a formal system is said to be semantically complete if and only if every theorem of the system is provable in the system.

complex number Any number consisting of both real numbers and imaginary numbers. It has the form a + bi, where a and b are real numbers and i = V-T; a is called the real part and bi the imaginary part. Because a or b can equal 0, any real or imaginary number is also a complex number. Invented as an extension of the real numbers so that certain algebraic equations such as x 2 + 1 = 0 would have solutions, the complex numbers form an algebraic field, meaning that they obey the commutative law and the associative law (with respect to addition and multiplication), as well as certain other rules in much the same way real numbers do (see field theory).

complex variable In mathematics, a variable that can take on the value of a complex number. In basic algebra, the variables x and y generally stand for values of real numbers. The algebra of complex numbers (complex analysis) uses the complex variable z to represent a number of the form a + bi. The modulus of z is its absolute value. A complex variable may be graphed as a vector from the origin to the point (a,b) in a rectangular coordinate system, its modulus corresponding to the vector’s length. Called an Argand diagram, this representation establishes a connection between complex analysis and vector analysis. See also Euler's formula.

composite family Family Compositae, one of the largest plant families (also known as Asteraceae, daisy family, and aster family), which contains more than 1,100 genera and almost 20,000 species of herbaceous plants, shrubs, and trees, found throughout the world. Though diverse in habit and habitat, composites tend to grow in sunlit places in temperate and subtropical regions. The family includes many garden ornamentals, including ageratums, asters, chrysanthemums, cosmos, dahlias, marigolds, and zinnias. Some genera include weeds such as dandelion, ragweed, and thistle. Artemisia, artichoke, endive, safflower, salsify, lettuce, and sunflower

are important for the products derived from their flowers, seeds, leaves, roots, or tubers. Flower heads in this family are composed of many small flowers (florets) surrounded by bracts. Bell-shaped disk florets form the centre of each head; strap-shaped ray florets extend out like petals from the centre and are sometimes reflexed (bent back). Some species have flowers with only disk or only ray florets.

composite material Solid material that results when two or more substances are combined (physically, not chemically) to create a new material whose properties are superior in a specific application to those of the original substances. The term specifically refers to a structural matrix (such as plastic) within which a fibrous material (such as silicon carbide) is embedded. Fibreglass-reinforced plastic is the best-known composite. Because of their stiffness, lightness, and heat resistance, composites are the materials of choice in numerous structural, reinforcing, and high-performance applications.

compost Mass of rotted organic matter made from decomposed plant material. It is used in agriculture and gardening generally to improve soil structure rather than as a fertilizer, because it is low in plant nutrients. When properly prepared, it is free of obnoxious odours. Composts commonly contain about 2% nitrogen, 0.5-1% phosphorus, and about 2%

potassium. Lime and nitrogen fertilizers and manure may be added to speed decomposition. The nitrogen of compost becomes available slowly and in small amounts. Because of their low nutrient content, composts are applied in large amounts.

compound Any substance composed of identical molecules consisting of atoms of two or more elements. Millions are known, each unique, with unique properties. Most common materials are mixtures of compounds. Pure compounds can be obtained by physical separation methods, such as precipitation and distillation. Compounds can be broken down into their constituents to various degrees or changed into new compounds by chemical reactions. Atoms always combine into molecules in fixed proportions, distinguishing compounds from solutions and other mechanical mixtures. Compounds are often classified as inorganic and organic compounds; coordination complexes, which contain metal atoms (usually transition elements) bonded to ligands that may be organic, are somewhat in between. Compounds may also be classified by whether they have ionic or covalent bonds (many include both types).

comprehension Act of or capacity for grasping with the intellect. The term is most often used in connection with tests of reading skills and language abilities, though other abilities (e.g., mathematical reasoning) may also be examined. Specialists in administering and interpreting such tests are known as psychometricians (see psychometrics) or differential psychologists. See also dyslexia; laterality; psychological testing; speech.

compressed air Air reduced in volume and held under pressure. Force from compressed air is used to operate numerous tools and instruments, including rock drills, train brake systems, riveters, forging presses, paint sprayers, and atomizers. Bellows have been used since the Early Bronze age to provide air for smelting and forging. The 20th century witnessed a large increase in the use of compressed-air devices. The introduction of jet engines for military and passenger aircraft stimulated the use and improvement of centrifugal and axial-flow compressors. Digital-logic

pneumatic-control components (developed in the 1960s) can be used in power and control systems (see pneumatic device).

compression ratio Degree to which the fuel mixture in an internal-combustion engine is compressed before ignition. It is defined as the volume of the combustion chamber with the piston farthest out divided by the volume with the piston in the full-compression position (see piston and cylinder). A compression ratio of six means that the action of the piston compresses the mixture to one-sixth its original volume. A high ratio promotes efficiency but may cause engine knock.

compressor Machine for increasing the pressure of a gas by mechanically decreasing its volume. Air is the most frequently compressed gas, but natural gas, oxygen, nitrogen, and other industrially important gases are also frequently compressed. There are three general types of compressors. Positive-displacement compressors are usually of the reciprocating piston type (see piston and cylinder), useful for supplying small amounts of a gas at relatively high pressures. Centrifugal compressors are particularly suited for compressing large volumes of gas to moderate pressures. Axial compressors are used for jet aircraft engines and gas turbines.

Compromise of T 850 Series of measures passed by the U.S. Congress to settle slavery issues and avert secession. The crisis arose in late 1849 when the territory of California asked to be admitted to the Union with a constitution prohibiting slavery. The problem was complicated by the unresolved question of slavery’s extension into other areas ceded by Mexico in 1848. In an attempt to satisfy pro- and antislavery forces. Sen. Henry Clay offered a series of measures that admitted California as a free state, left the question of slavery in the new territories to be settled by the local residents, and provided for the enforced return of runaway slaves and the prohibition of the slave trade in the District of Columbia. Support from Daniel Webster and Stephen A. Douglas helped ensure passage of the compromise. Moderates throughout the Union accepted the terms, which averted secession for another decade but sowed seeds of discord.

Compromise of 1867 or Ausgleich Vaus-.gllkX Compact that established the dual monarchy of Austria-Hungary. The kingdom of Hungary desired equal status with the Austrian empire, which was weakened by its defeat in the Austro-Prussian War of 1866. The Austrian emperor Francis Joseph gave Hungary full internal autonomy, together with a responsible ministry, and in return it agreed that the empire should still be a single great state for purposes of war and foreign affairs, thus maintaining its dynastic prestige abroad.

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Compton effect Change in wavelength of X rays and other energetic forms of electromagnetic radiation when they collide with electrons. It is a principal way in which radiant energy is absorbed by matter, and is caused by the transfer of energy from photons to electrons. When photons collide with electrons that are free or loosely bound in atoms, they

transfer some of their energy and momentum to the electrons, which then recoil. New photons of less energy and momentum, and hence longer wavelength, are produced; these scatter at various angles, depending on the amount of energy lost to the recoiling electrons. The effect demonstrates the nature of the photon as a true particle with both energy and momentum. Its discovery in 1922 by Arthur Compton was essential to establishing the wave-particle duality of electromagnetic radiation.

Compton, Arthur (Holly) (b. Sept. 10, 1892, Wooster, Ohio, U.S.— -d. March 15, 1962, Berkeley, Calif.) U.S. physicist. He taught at the University of Chicago (1923^45) and later served as chancellor (1945-54) and professor (1953-61) at Washington University. He is best known for his discovery and explanation of the Compton effect, for which he shared with C.T.R. Wilson the 1927 Nobel Prize for Physics. He was later instrumental in initiating the Manhattan Project, and he directed the development of the first nuclear reactors.

Compton-Burnett, Dame Ivy (b. June 5, 1884, Pinner, Middlesex, Eng.— d. Aug. 27, 1969, London) British novelist. She graduated from the University of London and published her first novel, Dolores, in 1911. Her second. Pastors and Masters (1925), introduced the style — employing clipped, precise dialogue to reveal her characters and advance the plot — that made her name. Her novels often dealt with struggles for power: Men and Wives (1931) featured a tyrannical mother, A House and Its Head (1935) a tyrannical father. She was created Dame of the British Empire in 1967.

computational complexity Inherent cost of solving a problem in large-scale scientific computation, measured by the number of operations required as well as the amount of memory used and the order in which it is used. The result of a complexity analysis is an estimate of how rapidly the solution time increases as the problem size increases, which can be used to analyze problems and assist in the design of algorithms for their solution.

computational linguistics (CL) Use of digital computers in unguistics research. The simplest examples are the use of computers to scan text and produce such aids as word lists, frequency counts, and concordances. From the mid-1950s to the mid-1960s progress was made by research groups working on machine translation and information retrieval. Theoretical CL deals with formal theories about linguistic knowledge, which today have reached a degree of complexity that can only be managed using powerful computers. Applied CL focuses on practical results of modeling human language use.

computed axial tomography Xto-'mag-ro-feN (CAT) or computed tomography (CT) Diagnostic imaging method using a low-dose beam of X-rays that crosses the body in a single plane at many different angles. Conceived by William Oldendorf and developed independently by Godfrey Hounsfield (b. 1919) and Allan M. Cormack (b. 1924), who shared a 1979 Nobel Prize for their inventions, this major advance in imaging technology became generally available in the early 1970s. Detectors record the strength of the exiting X-rays; this information is then processed by computer to produce a detailed two-dimensional cross-sectional image of the body. A series of such images in parallel planes or around an axis can show the location of abnormalities (especially tumours and other masses) more precisely than can conventional X-ray images.

computer Programmable machine that can store, retrieve, and process

data. Today’s computers have at least one CPU that performs most calculations and includes a main memory, a control unit, and an arithmetic logic unit. Increasingly, personal computers contain specialized graphic processors, with dedicated memory, for handling the computations needed to display complex graphics, such as for three-dimensional simulations and games. Auxiliary data storage is usually provided by an internal hard disk and may be supplemented by other media such as floppy disks or CD-ROMs. Peripheral equipment includes input devices (e.g., keyboard, mouse) and output devices (e.g., monitor, printer), as well as the circuitry and cabling that connect all the components. Generations of computers are characterized by their technology. First-generation digital computers, developed mostly in the U.S. after World War II, used vacuum tubes and were enormous. The second generation, introduced c. 1960, used transistors and were the first successful commercial computers. Third-generation

computers (late 1960s and 1970s) were characterized by miniaturization of components and use of integrated circuits. The microprocessor chip, introduced in 1974, defines fourth-generation computers. See illustration on following page.

computer, analog See analog computer
computer, digital See digital computer

computer-aided software engineering See CASE

computer animation also known as computer generated images (CGI) Form of animated graphics that has replaced “stop-motion” animation of scale-model puppets or drawings. Efforts to lessen the labour and costs of animation have led to simplification and computerization. Computers can be used in every step of sophisticated animation — for example, to automate the movement of the rostrum camera or to supply the in-between drawings for full animation. When a three-dimensional figure is translated into computer terms (digitized), the computer can generate and display a sequence of images that seem to move or rotate the object through space. Hence computer animation can simulate highly complex motion for medical and other scientific researchers, as well as for feature films.

computer architecture Internal structure of a digital computer, encompassing the design and layout of its instruction set and storage registers. The architecture of a computer is chosen with regard to the types of programs that will be run on it (business, scientific, general-purpose, etc.). Its principal components or subsystems, each of which could be said to have an architecture of its own, are input/output, storage, communication, control, and processing.

computer art Manipulation of computer-generated images (pictures, designs, scenery, portraits, etc.) as part of a purposeful creative process. Specialized software is used together with interactive devices such as digital cameras, optical scanners, styli, and electronic tablets. Because graphic images require large programs, the computers used in such work are generally among the fastest and most powerful available. Computer art has wide applications in advertising, publishing, and film.

computer-assisted instruction Use of instructional material presented by a computer. Since the advent of microcomputers in the 1970s, computer use in schools has become widespread, from primary schools

through the university level and in some preschool programs. Instructional computers either present information or fill a tutorial role, testing the student for comprehension. By providing one-on-one interaction and producing immediate responses to input answers, computers allow students to demonstrate mastery and learn new material at their own pace. A disadvantage is that computerized instruction cannot extend the lesson beyond the limits of the programming.

computer chip or chip Integrated circuit or small wafer of semiconductor material embedded with integrated circuitry. Chips comprise the processing and memory units of the modem digital computer (see microprocessor; RAM). Chip making is extremely precise and is usually done in a “clean room,” since even microscopic contamination could render the chip defective. As transistor components have shrunk, the number per chip has doubled about every 18 months (a phenomenon known as Moore’s law), from a few thousand in 1971 (Intel Corp.’s first chip) to millions by 1989. Nanotechnology is expected to make transistors even smaller and chips correspondingly more powerful in the 21st century.

computer circuitry Complete path or combination of interconnected paths for electron flow in a computer. Computer circuits are binary in concept, having only two possible states. They use on-off switches (transistors) that are electrically opened and closed in nanoseconds and picoseconds (billionths and trillionths of a second). A computer’s speed of operation depends on the design of its circuitry. Faster rates are achieved by shortening the time it takes to open and close the switches and by developing circuit paths that can handle the increased speeds.

computer graphics Use of computers to produce visual images, or the images so produced. Creating computer graphics requires a digital computer to store and manipulate images, a display screen, input/output devices, and specialized software that enables the computer to draw, colour, and manipulate images held in memory. Common computer graphic formats include GIF and JPEG, for single images, and MPEG and Quicktime, for multiframe images. The field has widespread use in business, scientific research, and entertainment. Monitors attached to CAD/CAM systems

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computer tower

monitor

power supply

cooling fan

external

speaker

» CD/DVD-
ROM drive

ribbon cable

battery

keyboard

scroll wheel

expansion
slots — =

micro-
processor

cooling

blades

video card

mouse

mechanical mouse

(bottom view)

network card

right click switch
scroll wheel

USB

connector

motherboard

roller

internal speaker

cooling fan

encoder

left x

click

switch

ball

(rolls on
surface)

read/write head

cable

hard drive

spindle.

PS/2

connector

circuit

board

saved file

optical mouse

(bottom view)

actuator

outer/

casing

camera

light beam
(reflects
from surface)

prism

circuit board

A typical personal computer system consists of the computer itself, a video monitor, a
scanner, camera, microphone, or external storage device. Chips and circuit boards ("car
are housed in the computer case and controlled by a card called a controller. The micro
with its millions of transistors. Data and programs in use are stored in the RAM chips.
cal disks, such as CD-ROMs and DVDs, may store data as well. Some circuit boards are de
music. Additional boards, such as a modem, may be added by inserting them into an expar
mouse is an input device used to position a pointer on the computer's screen. On-screer
the computer.

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have replaced drafting boards. Computer simulation using graphically dis-
played quantities permits scientific study and testing of such phenomena as
nuclear and chemical reactions, gravitational interactions, and physiologi-
cal systems. See also computer animation; computer art.

computer-integrated manufacturing Data-driven automation
that affects all systems or subsystems within a manufacturing environ-
ment: design and development, production (see CAD/ CAM), marketing
and sales, and field support and service. Basic manufacturing functions
as well as materials-handling and inventory control can also be simulated

by computers before the system is built in an attempt to eliminate wast-
age. See also artificial intelligence, expert systems, robotics.

computer network See computer network
computer printer See computer printer
computer program See computer program

computer science Study of computers, their design (see computer
architecture), and their uses for computation, data processing, and systems
control, including design and development of computer hardware and

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software, and programming. The field encompasses theory, mathematical activities such as design and analysis of algorithms, performance studies of systems and their components, and estimation of reliability and availability of systems by probabilistic techniques. Because computer systems are often too large and complicated for failure or success of a design to be predicted without testing, experimentation is built into the development cycle.

computer virus Computer program designed to copy itself into other programs, with the intention of causing mischief or damage. A virus will usually execute when it is loaded into a computer's memory. On execution, it instructs its host program to copy the viral code into any number of other programs and files stored in the computer. The corrupted programs may continue to perform their intended functions while also executing the virus's instructions, thus further propagating it. The infection may transfer itself to other computers through storage devices, computer networks, and on-line systems. A harmless virus may simply cause a cryptic message to appear when the computer is turned on; a more damaging virus can destroy valuable data. Antivirus software may be used to detect and remove viruses from a computer, but the software must be updated frequently for protection against new viruses.

computer vision Field of robotics in which programs attempt to identify objects represented in digitized images provided by video cameras, thus enabling robots to "see." Much work has been done on stereo vision as an aid to object identification and location within a three-dimensional field of view. Recognition of objects in real time, as would be needed for active robots in complex environments, usually requires computing power beyond the capabilities of present-day technology. See also pattern recognition.

computing, quantum See quantum computing

Comstock, Anthony (b. March 7, 1844, New Canaan, Conn., U.S. — d. Sept. 21, 1915, New York, N.Y.) U.S. social reformer. He was an early agitator against abortion and pornography, lobbying successfully for the enactment (1873) of a severe federal statute outlawing the transportation of obscene matter in the mails (the Comstock Law). In that same year, he founded the Society for the Suppression of Vice, which he directed until his death. As a special agent of the U.S. Post Office (1 873—1915), he conducted spectacular raids on publishers and vendors. His books include Traps for the Young (1883) and Morals Versus Art (1888).

Comte \'ko n t\, (Isidore-) Auguste (-Marie-Francois-Xavier)

(b. Jan. 19, 1798, Montpellier,

France — d. Sept. 5, 1857, Paris)

French thinker, the philosophical founder of sociology and of positivism.

A disciple of Henri de Saint-Simon, he taught at the Ecole Polytechnique (1 832 — 42) but gave free lectures to workingmen. He gave the science of sociology its name and established the new subject on a conceptual (though not empirical) basis, believing that social phenomena could be reduced to laws just as natural phenomena could. His ideas influenced John Stuart Mill (who supported him financially for many years), Emile Durkheim, Herbert Spencer, and Edward Burnett Tylor. His most important works are Cours de philosophie positive (6 vol., 1830-42) and Systeme de politique positive (4 vol., 1851-54).

Conakry Vka-no-.kre, ko-na-'kre\

Capital (regional pop., 1999 est.: 1,764,000), largest city, and chief Atlantic port of Guinea. Located on Tombo Island and the Kaloum Peninsula, it was founded by the French in 1884. It became the capital successively of the protectorate of Rivieres du Sud (1 89 1), the colony of French Guinea (1893), and independent Guinea (1958). Tombo Island, the site of the original settlement, is linked to the peninsula by a causeway. The city was industrialized in the 1950s after iron mining and bauxite production had been developed. It is the seat of the University of Conakry (1962).

Conall Cernach Vko-n3l-'k y er-n3k\ Legendary warrior of Celtic mythology who appears in many stories. In “Bricriu’s Feast” in the Ulster cycle, he is one of three knights challenged by a giant to let him chop their heads off after they behead him; of the three, only Cu Chulainn keeps the bargain. Conall Cernach is probably related to Cernunnos, and their names may be cognates. See also Gawain.

Conan Doyle, Sir Arthur (b. May 22, 1859, Edinburgh, Scot. — d. July 7, 1930, Crowborough, Sussex, Eng.) Scottish writer. He became a doctor and practiced until 1891, studying with Dr. Joseph Bell, who was the model for his fictional detective, Sherlock Holmes. Conan Doyle was knighted for his medical work in the second South African War and his public defense of the war. Holmes first appeared in “A Study in Scarlet” (1887). Collections of Holmes stories began with The Adventures of Sherlock Holmes (1892). Tiring of Holmes, Conan Doyle devised his death in 1893, only to be forced by public demand to restore him to life. His other Holmes novels include The Sign of Four (1890), The Hound of the Baskervilles (1902), and The Valley of Fear (1915). His historical romances include The White Company (1890). Late in life, Conan Doyle devoted himself to spiritualism.

Conant Vko-n3nt\, James B(ryant) (b. March 26, 1893, Dorchester, Mass., U.S. — d. Feb. 11, 1978, Hanover, N.H.) U.S. educator and scientist, president of Harvard University (1933-53). Conant received a Ph.D.

(1916) from Harvard and taught chemistry there until he was elected its president in 1933. He led the university to broaden the social and geographic makeup of its student body. During World War II he was a central figure in organizing American science, including the development of the atomic bomb. In 1953 he was appointed U.S. high commissioner for West Germany, and in 1955 he was appointed ambassador. His publications include chemistry textbooks, works on science for the lay reader, and books on educational policy.

concentration camp Internment centre established by a government to confine political prisoners or members of national or minority groups for reasons of state security, exploitation, or punishment. The prisoners are usually selected by executive decree or military order. Camps are usually built to house many people, typically in highly crowded conditions. Countries that have used such camps include Britain during the South African War, the Soviet Union (see Gulag), the U.S. (see Manzanar Relocation Center), and Japan, which interned Dutch civilians in the Dutch East Indies during World War II. A variation, called a “reeducation camp,” was widely used in China during the Cultural Revolution and in Cambodia under the Khmer Rouge. Most notorious were the death camps of Nazi Germany, including Auschwitz, Bergen- Belsen, Buchenwald, Dachau, and Treblinka.

Concepcion \,k6n-sep-'sy6n\ City (pop., 2002 prelim.: 371,000), capital of Bio-Bio region, south-central Chile. One of Chile’s largest cities, it was founded in 1550 on the Pacific coast, where it was twice burned by Araucanian Indians. It has also been struck by numerous earthquakes, two of which were followed by tsunamis, and in 1754 it was moved inland to its present site near the mouth of the Bio- Bio River. Despite its severe seismic activity, it has become a major commercial and industrial centre and a distribution point for southern Chile. Local industries include textiles, food products, and steel.

concept formation Process of developing abstract rules or mental constructs based on sensory experience. Concept formation figures prominently in cognitive development and was a subject of great importance to Jean Piaget, who argued that learning entails an understanding of a phenomenon’s characteristics and how they are logically linked. Noam Chomsky later argued that certain cognitive structures (such as basic grammatical rules) are innate in human beings. Both scholars held that, as a concept emerges, it becomes subject to testing: a child’s concept of “bird,” for example, will be tested against specific instances of birds. The human capacity for play contributes importantly to this process by allowing for consideration of a wide range of possibilities.

Conception Bay Inlet of the Atlantic Ocean, southeastern Newfoundland, Canada. Named by a Portuguese explorer who visited the coast in 1500 on the Feast of the Conception, it is about 30 mi (50 km) long and 12 mi (19 km) wide. Its shore settlements, among Newfoundland’s oldest and most densely populated, support seafood canneries and beach resorts.

conceptual art Any of various art forms in which the idea for a work of art is considered more important than the finished product. The theory was explored by Marcel Duchamp from c. 1910, but the term was coined

Comte, drawing by Tony Toullion, 1 9th century; in the Bibliotheque Nationale,

Paris.

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in the late 1950s by Edward Kienholz. In the 1960s and ’70s it became a major international movement; its leading exponents were Sol LeWitt (b. 1928) and Joseph Kosuth (b. 1945). Its adherents radically redefined art objects, materials, and techniques, and began questioning the very existence and use of art. Its claim is that the “true” work of art is not a physical object produced by the artist for exhibition or sale, but rather consists of “concepts” or “ideas.” Typical conceptual works include photographs, texts, maps, graphs, and image-text combinations that are deliberately rendered visually uninteresting or trivial in order to divert attention to the “ideas” they express. Its manifestations have been extremely diverse; a well-known example is Kosuth’ s One and Three Chairs (1965), which combines a real chair, a photograph of a chair, and a dictionary definition of “chair.” Conceptual art was fundamental to much of the art produced in the late 20th century.

Concert of Europe In the post-Napoleonic era, the consensus among the European monarchies favoring preservation of the territorial and political status quo. The term assumed the responsibility and the right of the great powers to intervene in states threatened by internal rebellion. The powers discussed such intervention at several congresses, including those of Aix-la-Chapelle, Troppau, Laibach, and Verona.

concertina Portable bellows-operated musical instrument. The first concertina was patented by Sir Charles Wheatstone in London in 1829, and he later produced an instrument with full chromatic capacity. Like the accordion, its sound is produced by free reeds, but it uses buttons rather than keys. The very similar Argentinian bandoneon is square rather than hexagonal.

concerto \k3n-'cher-to\ Musical composition for solo instrument and orchestra. The solo concerto grew out of the older concerto grosso. Giuseppe Torelli’s violin concertos of 1698 are the first known solo concertos. Antonio Vivaldi, the first important concerto composer, wrote more than 350 solo concertos, mostly for violin. Johann Sebastian Bach wrote the first keyboard concertos. From the Classical period on, most concertos have been written for piano, followed in popularity by the violin and then the cello. Wofgang Amadeus Mozart wrote 27 piano concertos; other notable composers of piano concertos include Ludwig van Beethoven, Felix Mendelssohn, Frederic Chopin, Franz Liszt, and Johannes Brahms. From the outset the concerto has been almost exclusively a three-movement form, with fast tempos in the first and third movements and a slow central movement. It has generally been intended to display the soloist’s virtuosity, particularly in the unaccompanied and often improvised cadenzas near the ends of the first and third movements. Nineteenth-century con-

certos were often conceived as a kind of dramatic struggle between soloist and orchestra; many later composers preferred that the soloist blend with the orchestra.

concerto grosso Principal orchestral music of the Baroque era, characterized by contrast between a small group of soloists and a larger orchestra. The small group (concertino) usually consisted of two violins and continuo, the instruments of the older trio sonata, though wind instruments were also used. The larger group (ripieno) generally consisted of strings with continuo. Alessandro Stradella (1642-82) wrote the first known concerto grosso c. 1675. Arcangelo Corelli's set of 12 (c. 1680-90), Johann Sebastian Bach's Brandenburg Concertos (c. 1720), and George Frideric Handel's Opus 6 concertos (c. 1740) are the most celebrated examples. From 1750 the concerto grosso was eclipsed by the solo CONCERTO.

conch Ykaqk, 'kanch\ Marine snail whose shell has a broadly triangular outer whorl and a wide lip, often jutting toward the uppermost point.

True conchs (family Strombidae) feed on fine plant matter in warm waters. The queen conch (Strombus gigas), found from Florida to Brazil, has an ornamental shell; the pink opening into the first whorl of the shell may be 12 in. (30 cm) long. The clam-eating fulgur conchs (family Melongenidae) include the channeled conch (Busycon canaliculatwri) and the lightning conch {B. contrarium), both about 7 in. (18 cm)

long and common on the U.S. Atlantic coast. See also whelk.

Conchobar mac Nessa Vka-nii-or-mok-'ne-so, 'karj-ko-or-mok-'ne-so\ or Conor \'ka-nor\ In ancient Irish Gaelic literature, the reputed king of the Ulaids of northeastern Ireland at the beginning of the 1st century bc. In the Ulster cycle he is the ideal Irish king. In The Book of Leinster (c. 1160), Conor fell in love with the beauty Deirdre. Deirdre, however, was in love with Nofsi, with whom she eloped and lived in Scotland; Conor's slaying of his rival caused a revolt in Ulster, and Deirdre killed herself.

Conciliar Movement Xkon-'si-le-orV (1409^19) In Roman Catholicism, an effort to strengthen the authority of church councils over that of the papacy. Originally aimed at ending the Western Schism, the Conciliar Movement had its roots in legal and intellectual circles in the 13th century but emerged as a force at the Council of Pisa (1409), which elected a third pope in an unsuccessful attempt to reconcile the parties of the existing pope and antipope. A second council, the Council of Constance (1414—18), ended the schism by voiding all papal offices and electing a new pope. Participants hoped to play an ongoing role in the church, but the popes continued to seek supremacy, and the Council of Basel (143 1—49) ended fruitlessly.

conclave In the Roman Catholic church, the assembly of cardinals gath-

ered to elect a new pope and the system of strict seclusion to which they submit. From 1059 the election became the responsibility of the cardinals. When, after the death of Clement IV (1268), the cardinals dithered for more than two years, the local magistrate locked them in the episcopal palace and fed them only bread and water until they elected Gregory X. The system of meeting in closed conclave was codified in 1904 by Pius X. Voting is by secret ballot; one ballot is held on the first afternoon of the conclave and four on each subsequent day, two in the morning and two in the afternoon, until a new pope is chosen. In 1996 John Paul II declared that, after 30 ballots, the traditional requirement of a two-thirds majority plus one for the election of a pope could be superseded, at the discretion of the cardinals, by election by a simple majority. Ballots are burned in a stove after each vote, and the smoke produced by their burning, which issues from a special pipe through a window, indicates to the crowd assembled in St. Peter’s Square whether a new pope has been elected: if there is a new pope, the smoke will be white; if no majority has yet been reached, the smoke will be black. In addition, bells will be rung to confirm the signal. Additives are mixed with the ballots to ensure the proper colour of the smoke.

Concord Vkan-kord, 'kan-,k6rd\ City (pop., 2000: 121,780), western California, U.S. Located near San Francisco, it was laid out in 1868 as Todos Santos and renamed in 1869 for Concord, Mass. Developed as an orchard and poultry centre after the railroad reached it in 1912, it is now mainly residential.

Concord Town (pop., 2000: 16,993), eastern Massachusetts, U.S. Founded in 1635, it was the first inland Puritan settlement. In 1775 the British were marching to seize its storehouse of military supplies when they were checked by minutemen (see Battles of Lexington and Concord). In the 19th century it was a noted cultural centre and the home of writers Ralph Waldo Emerson, Henry David Thoreau, Nathaniel Hawthorne, and Louisa May Alcott (all buried there). Several historic houses are now museums; Walden Pond, where Thoreau lived and wrote, is nearby.

Concord City (pop., 2000: 40,687), capital of New Hampshire, U.S. It lies along the Merrimack River above Manchester. Settled in 1727, the community was incorporated in 1733 by Massachusetts as Rumford but, following bitter litigation, was determined in 1762 to be within the jurisdiction of New Hampshire. Renamed Concord in 1765, it was made the capital in 1808. Printing, carriage making, and granite quarrying were important in its early development; Concord granite is still quarried.

Concord, Battles of Lexington and See Battles of Lexington and Concord

Concordat of 1 801 Agreement between Napoleon and Pope Pius VII that defined the status of the Roman Catholic Church in France and ended the breach caused by the church reforms of the French Revolution (see Civil Constitution of the Clergy). The Roman Catholic faith was acknowledged as the religion of the majority of the French people but was not proclaimed as the established religion of the state. Napoleon gained the right to nominate bishops, but their offices were conferred by the pope. The government agreed to pay the clergy, but confiscated church property was not restored. The Concordat remained in effect until 1905.

Florida horse conch (Pleuroploca gigantea)

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Concorde First supersonic, passenger-carrying, commercial airplane. Built jointly by British and French manufacturers, it entered regular service in 1976. Its maximum cruising speed is 1,354 mph (2,179 kph), more than twice the speed of sound; the London-New York flight takes less than four hours and can cost close to $10,000.

concrete Artificial stone made of a mixture of cement, aggregate (hard material), and water. In addition to its potential for immense compressive strength and its ability, when poured, to adapt to virtually any form, concrete is fire-resistant and has become one of the most common building materials in the world. The binder usually used today is Portland cement. The aggregate is usually sand and gravel. Additives called admixtures may be used to accelerate the curing (hardening) process in low temperature conditions. Other admixtures trap air in the concrete or slow shrinkage and increase strength. See also precast concrete, prestressed concrete, reinforced CONCRETE.

concubinage Nkon-'kyii-bo-nijX Cohabitation of a man and a woman without the full sanctions of legal marriage. In the Judeo-Christian tradition, the term concubine has been generally applied exclusively to women; Western studies of non- Western societies use it to refer to partners who are sanctioned by law but lack the status of full wives. See also common-law marriage; harem; polygamy.

concurrent programming Computer programming designed for execution on multiple processors, where more than one processor is used to execute a program or complex of programs running simultaneously. It is also used for programming designed for a multitasking environment, where two or more programs share the same memory while running concurrently.

concussion Period of nervous-function impairment that results from relatively mild brain injury, often with no bleeding in the cerebral cortex. It causes brief unconsciousness, followed by mental confusion and physical difficulties. These effects usually clear up within hours, but in some cases disturbance of consciousness continues, and there may be residual symptoms. Some level of amnesia often accompanies concussion. Recovery from concussion is almost always complete unless more serious injury, such as skull fracture, accompanies it.

Conde \ko n -'da\, Louis II de Bourbon, 4th prince de known as the Great Conde (b. Sept. 8, 1621, Paris, France — d. Dec. 11, 1686, Fontainebleau) French military leader. He distinguished himself in battles with Spain in the Thirty Years' War, and in 1649 he helped suppress the Fronde uprising. After being arrested by Mazarin in 1650, he rebelled and

led the second Fronde, fighting from Spain until he was defeated at the Battle of the Dunes in 1658. Pardoned the next year, he again became one of Louis XIV’ s greatest generals, winning numerous battles in Spain, Germany, and Flanders. He was a man of great courage, unconventional habits, and sound independence of mind; broadly cultivated, he counted Mouere and Jean Racine among his friends. See also Conde family.

Conde \kon-'da\ family Important French branch of the house of Bourbon, whose members played a significant role in French dynastic politics. The line began with Louis I de Bourbon (1530-69), 1st prince de Conde, a military leader of the Huguenots in France’s Wars of Religion. The family’s most prominent member was the 4th prince de Cond£, one of Louis XIV’ s greatest generals. The princely line died out when Louis- Antoine-Henri de Bourbon-Conde (1772-1804), duke d’Enghien and sole heir of the last prince de Conde, was falsely arrested and, on Napoleon’s orders, shot for treason.

condensation Formation of a liquid or solid from its vapour. Condensation usually occurs on a surface that is cooler than the adjacent gas. A substance condenses when the pressure exerted by its vapour exceeds the vapour pressure of its liquid or solid phase at the temperature of the surface where the condensation is to occur. The process causes the release of thermal energy. Condensation occurs on a glass of cold water on a warm, humid day when water vapour in the air condenses to form liquid water on the glass’s colder surface. Condensation also accounts for the formation of dew, fog, rain, snow, and clouds.

condenser Device for reducing a gas or vapour to a liquid. Condensers are used in power plants to condense exhaust steam from turbines and in refrigeration plants to condense refrigerant vapours, such as ammonia and Freons. The petroleum and chemical industries use condensers for hydrocarbons and other chemical vapours. In distillation, a condenser transforms vapour to liquid. All condensers work by removing heat from

the gas or vapour. In some, the gas passes through a long tube of heat-conductive metal, such as copper (usually arranged in a coil or other compact shape), and heat escapes into the surrounding air. Large industrial condensers use water or some other liquid to remove the heat. The term condenser also refers to a device attached to carding machines in textile factories to collect fibres into roving for spinning machines.

Condillac \ko n -de-'yak\, Etienne Bonnot de (b. Sept. 30, 1715, Grenoble, France — d. Aug. 2/3, 1780, Flux) French philosopher, psychologist, and economist. He was ordained a priest in 1740. In his Essay on the Origin of Human Knowledge (1746), he systematically discussed the empiricism of John Locke. In Treatise on Sensations (1754), he questioned Locke’s doctrine that intuitive knowledge is available directly through the senses. In his works Logic (1780) and The Language of Calculation (1798), he emphasized the importance of language in logical reasoning and stressed the need for a scientifically designed language. His economic views, presented in Commerce and Government (1776), were based on the notion that value depends on utility rather than labour. The need for something useful, he argued, gives rise to value, while prices result from the exchange of valued items.

conditioning Process in which the frequency or predictability of a behavioral response is increased through reinforcement (i.e., a stimulus

or a reward for the desired response). Classical, or respondent, conditioning, which involves stimulus substitution, is based on the work of Ivan Pavlov, who conditioned dogs by ringing a bell each time the aroma of food was presented. Eventually the dogs salivated when the bell rang, even if no food odour was present; salivation was thus the conditioned response. In instrumental, or operant, conditioning, a spontaneous (operant) behaviour is either rewarded (reinforced) or punished. When rewarded, a behaviour increases in frequency; when punished, it decreases. Operant conditioning was studied in detail by B.F. Skinner.

condominium In modern property law, individual ownership of one dwelling unit within a multidwelling building. Unit owners have undivided ownership interest in the land and those portions of the building shared in common. This type of ownership has been present in Europe since the end of the Middle Ages; in the U.S. it dates to the latter half of the 19th century and has been popular in crowded urban areas. An alternative to the condominium is the cooperative, in which residents own a share of a corporation, with each share entitling the owner to reside in a particular unit in the building.

condor Either of two species of large New World vultures. Two of the largest flying birds, each is about 4 ft (1.2 m) long. Both feed on dead animals. The Andean condor (Vultur gryphus), which ranges from the Pacific coast of South America to the high Andes Mountains, has slightly longer wings (10 ft [3 m]) and is black with a white ruff and bare pinkish head and neck. The California condor (Gymnogyps calif ornianus) is nearly black, with white wing linings, a bare yellow head, and a red neck. It hovered on the brink of extinction in the 1980s, and every California condor was captured. Careful nurturing has since led to the release of more than 200 condors into the wild.

Condorcet \ko n -dor-'se\ / Marie-Jean-Antoine-Nicolas de Caritat, marquis de (b. Sept. 17, 1743, Ribemont, France — found dead March 29, 1794, Bourg-la-Reine) French mathematician, statesman, and revolutionary. He showed early promise as a mathematician and was a protege of Jean Le Rond d'Alembert. In 1777 he became secretary of the Academy of Sciences. In sympathy with the French Revolution, he was elected to represent Paris in the Legislative Assembly (1791-92), where he called for a republic. His opposition to the arrest of the moderate Girondins led to his being outlawed (1792). While in hiding he wrote his famous Sketch for a Historical Picture of the Progress of the Human Mind, in which he advanced the idea of the continuous progress of the human race to an ultimate perfection. He was captured and subsequently found dead in prison.

conducting Art of leading a group of musical performers. Simple coordination of a group does not always require a conductor (members of a Renaissance choir kept together by one tapping another on the shoulder, for example, and musicians in a recording studio listen to a “click track” on headphones). Before c. 1800, the first violinist usually gave the few necessary signals with his bow; the keyboard player might also lead the orchestra, using his hands and head. In the 19th century the larger size of ensembles and growing complexity of music, including its varying tempos and heightened expressiveness, made it necessary for a person to

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coordinate and interpret the music for the group. The first conductors, including Felix Mendelssohn, Hector Berlioz, and Richard Wagner, were composers themselves. By the end of the 19th century, conducting had become a specialty and the great conductors had become celebrities in their own right.

conduction See thermal conduction

conductor Any of various substances that allow the flow of electric current or thermal energy. A conductor is a poor insulator because it has a low resistance to such flow. Electrical conductors are used to conduct electric current, as in the metal wires of an electric circuit. Electrical conductors are usually metallic. Thermal conductors allow thermal energy to flow because they do not absorb radiant heat; they include materials such as metal and glass.

cone or strobilus \stro-'bI-l9s, 'stro-b9-bs\ In botany, a mass of scales or bracts, usually ovate, containing the reproductive organs of certain non-flowering plants. A distinguishing feature of pines and other conifers, the cone is roughly analogous to the flower of other plants. Cones (strobili) are also found on club mosses and horsetails.

conef lower Any of three genera (Echinacea , Ratibida, and Rudbeckia). They are weedy plants in the composite family, native to North America. Some species in each genus have reflexed ray flowers. The purple-flowered perennials E. angustifolia and E. purpurea are often cultivated as border plants; they have strong-smelling black roots and hairy stems. These two species, along with E. pallida, are used to prepare an herbal cold and flu remedy called echinacea. Ratibida species have yellow ray flowers and brownish disk flowers. Prairie coneflowers {Ratibida columnaris and R. pinnata) are grown in wildflower gardens. Rudbeckia species have yellow ray flowers and brown or black disk flowers. Black-eyed Susan {Rudbeckia hirta), thimble-flower {R. bicolor), and cutleaf coneflower {R. laciniata) are grown as border plants.

Conestoga wagon Horse-drawn covered freight wagon. It originated in the 1 8th century in the Conestoga Creek region of Pennsylvania. It had a flat body and low sides; with its floor curved up at each end to prevent freight from shifting, it was well suited for travel over early American roads. It became famous as later adapted by westward- traveling pioneers for hauling their possessions; with its tall white canvas top, it resembled a sailing ship from a distance, which earned it the name “prairie schooner.”

coney See cony

Coney Island Amusement area, southern Brooklyn, N.Y., U.S. It was an island in the Atlantic Ocean until its creek silted up and it became part of Long Island. The first pavilion and bathhouse were erected in 1844, and it gained popularity with the coming of the subway in 1920. It has a 3.5-mi (5.6-km) boardwalk and an amusement park known for its roller coaster (the Cyclone). It is also the site of the New York Aquarium.

Confederate States of America or Confederacy Government of the 11 Southern states that seceded from the Union in 1860-61 until its defeat in the American Civil War in 1865. In the months following Abraham Lincoln’s election as president in 1860, seven states of the Deep South (Alabama, Florida, Georgia, Louisiana, Mississippi, South Carolina, and Texas) seceded. After the attack on Fort Sumter in April 1861, Arkansas, North Carolina, Tennessee, and Virginia joined them. The government was directed by Jefferson Davis as president, with Alexander H. Stephens as vice president. Its principal goals were the preservation of states' rights and the institution of slavery. The government’s main concern was raising and maintaining an army. It counted on the influence of King Cotton to exert financial and diplomatic pressure on the Union from sympathetic European governments. Battlefield victories for the South in 1861-62 gave the Confederacy the moral strength to continue fighting, but from 1 863 dwindling finances and battlefield reverses increasingly led to demoralization. The surrender at Appomattox Court House by Gen. Robert E. Lee precipitated its dissolution.

Confederation, Articles of See Articles of Confederation

Confederation of the Rhine (1806-13) Union of all the states of Germany, except Austria and Prussia, under the aegis of Napoleon. Napoleon’s primary interest in the confederation, which enabled the French to unify and dominate the country, was as a counterweight to Austria and Prussia. The confederation was abolished after Napoleon’s fall from power, but the consolidation it entailed contributed to the movement for German unification.

Confessing Church German Bekennende Kirche Movement for revival within the German Protestant churches that developed in the 1930s in resistance to Adolf Hitler’s attempt to make the churches an instrument of Nazi propaganda and politics. The Confessing Church, whose leaders included Martin Niemoller and Dietrich Bonhoeffer, opposed Hitler’s “German Christians” and was forced underground as Nazi pressure intensified. The movement continued in World War II, though it was hampered by the conscription of clergy and laity. In 1948 the church ceased to exist when the reorganized Evangelical Church was formed.

confession In the Judeo-Christian tradition, acknowledgment of sinfulness, in public or private, regarded as necessary for divine forgiveness. In the Temple period, Yom Kippur included a collective expression of sinfulness, and the day continues in Judaism as one of prayer, fasting, and confession. The early Christian Church followed John the Baptist’s practice of confession before baptism, but soon instituted confession and penance for the forgiveness of sins committed after baptism. The fourth Lateran Council (1215) required annual confession. The Roman Catholic and Eastern Orthodox churches consider penance a sacrament, but most Protestant churches do not.

confidential communication See privileged communication

configuration In chemistry, the arrangement in space of the atoms in a molecule. It is especially important in organic chemistry (see organic compound), in which each carbon atom in a molecule can form from two to four covalent bonds (see bonding) with as many as four other atoms. A carbon atom with four single bonds, for example, lies at the centre of

a tetrahedron, with one bond extending to each comer; if three or all four atoms bonded to the carbon are different, the structure that results has two different mirror-image (see optical activity; isomer) forms, similar to left- and right-handed gloves. Configuration issues also apply to some inorganic compounds. Until late in the 20th century, chemists struggled to determine the true three-dimensional form (absolute configuration) of a molecule experimentally, but modem optical and chemical methods have greatly simplified the task. The term electronic configuration refers to the number of electrons in the various shells of an atom, which defines its chemical reactivity and the type of bonding in which it participates.

confirmation Christian rite in which believers reaffirm the faith into which they were baptized as infants or young children. The rite admitting adults to full membership in the community of the faithful did not exist as a distinct ceremony in the early church but probably coincided with baptism, since those who joined did so as adults and were baptized after instruction. As baptism of infants became common, some means of ascertaining their knowledge and commitment as young adults became necessary. A period of instruction was introduced, after which the candidates were examined and confirmed. In Roman Catholicism confirmation became a sacrament, usually performed by a bishop. The rite is also used in the Anglican and Lutheran churches.

confiscation In law, the act of seizing property without compensation and submitting it to the public treasury. Illegal items such as narcotics or firearms, or profits from the sale of illegal items, may be confiscated by the police. Additionally, government action (e.g., zoning or rate setting) that reduces the value of property to an owner so as to make it nearly worthless has been held to constitute confiscation. See also eminent domain, SEARCH AND SEIZURE.

conflict In psychology, a struggle resulting from incompatible or opposing needs, drives, wishes, or demands. Interpersonal conflict represents such a struggle between two or more people, while internal conflict is a mental struggle. A child experiencing internal conflict, for example, may be dependent on his mother but fear her because she is rejecting and punitive. Conflicts that are not readily resolved may cause the person to suffer helplessness and anxiety. See also learned helplessness.

conformal map In mathematics, a transformation of one graph into another in such a way that the angle of intersection of any two lines or curves remains unchanged. The most common example is the Mercator map, a two-dimensional representation of the surface of the earth that preserves compass directions. Other conformal maps, sometimes called orthomorphic projections, preserve angles but not shapes.

Confucianism Scholarly tradition and way of life propagated by Confucius in the 6th-5th century bc and followed by the Chinese for more than two millennia. Though not organized as a religion, it has deeply influenced East Asian spiritual and political life in a comparable manner.

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The core idea is ren (“humaneness,” “benevolence”), signifying excellent character in accord with li (ritual norms), zhong (loyalty to one’s true nature), shu (reciprocity), and xiao (filial piety). Together these constitute de (virtue). Mencius, Xunzi, and others sustained Confucianism, but it was not influential until Dong Zhongshu emerged in the 2nd century bc. Confucianism was then recognized as the Han state cult, and the Five Classics became the core of education. In spite of the influence of Daoism and Buddhism, Confucian ethics have had the strongest influence on the moral fabric of Chinese society. A revival of Confucian thought in the 11th century produced Neo-Confucianism, a major influence in Korea during the Choson dynasty and in Japan during the Tokugawa period.

Confucius Chinese Kongfuzi or K'ung-fu-tzu Vkurp'fii-'dzoV (b. 551 bc, Ch’ii-fu, state of Lu — d. 479, Lu) Ancient Chinese teacher, philosopher, and political theorist. Born into a poor family, he managed stables and worked as a bookkeeper while educating himself. Mastery of the six arts — ritual, music, archery, charioteering, calligraphy, and arithmetic — and familiarity with history and poetry enabled him to begin a brilliant teaching career in his thirties. Confucius saw education as a process of constant self-improvement and held that its primary function was the training of noblemen (junzi). He saw public service as the natural consequence of education and sought to revitalize Chinese social institutions, including the family, school, community, state, and kingdom. He served in government posts, eventually becoming minister of justice in Lu, but his policies attracted little interest. After a 12-year self-imposed exile during which his circle of students expanded, he returned to Lu at age 67 to teach and write. His